

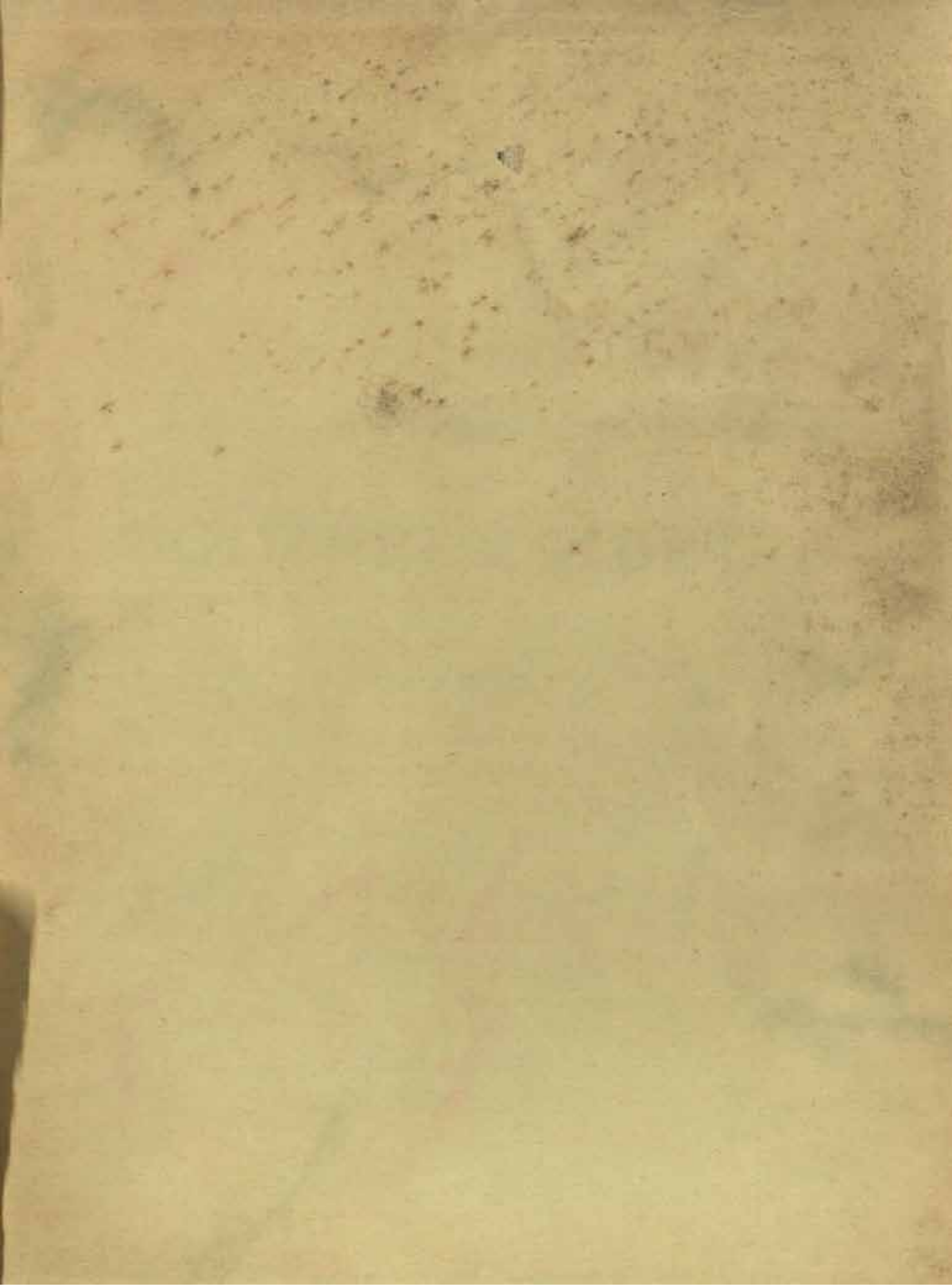
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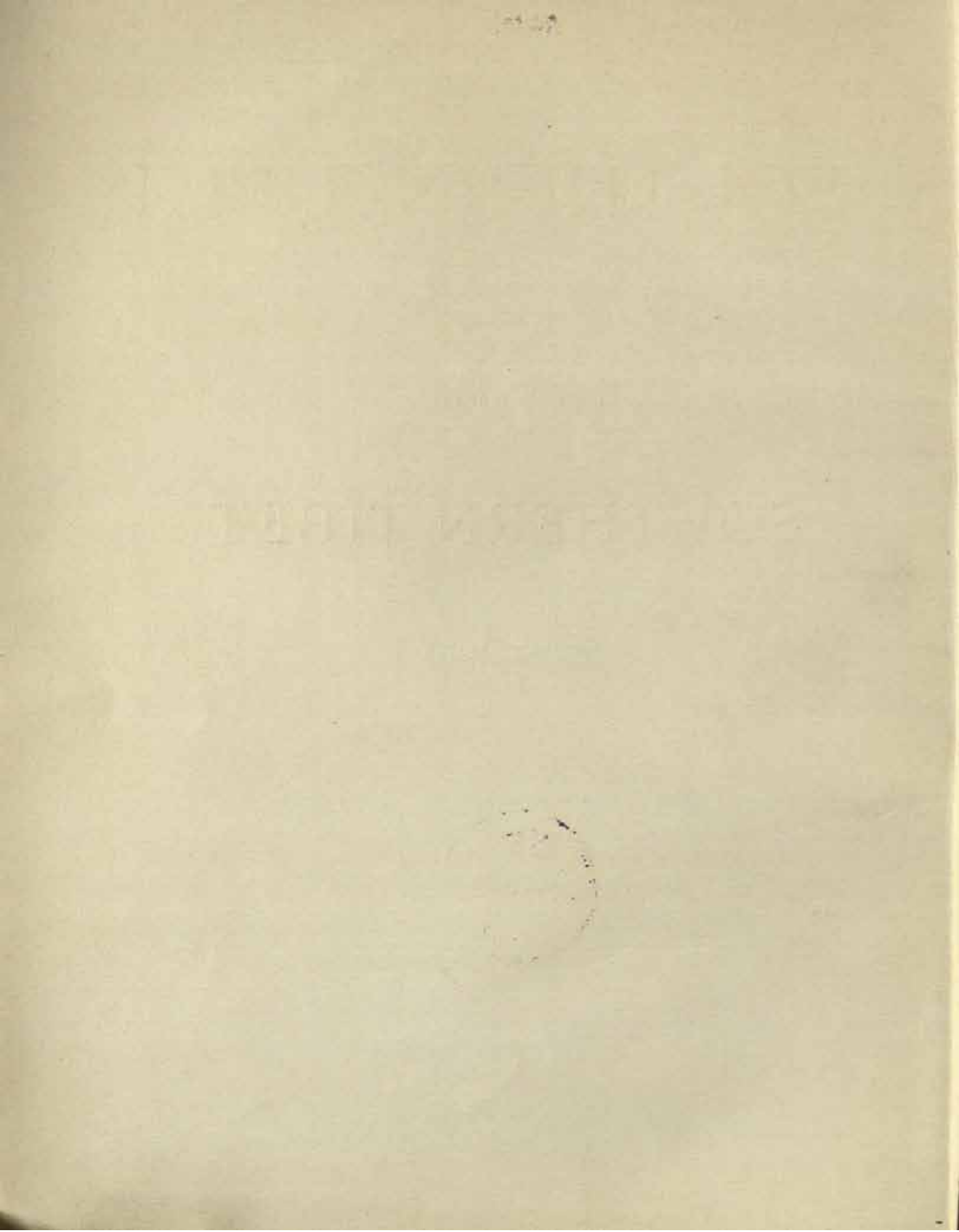
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SVEN HEDIN

SOUTHERN TIBET

1906—1908



SOUTHERN TIBET

DISCOVERIES IN FORMER TIMES COMPARED
WITH MY OWN RESEARCHES IN 1906—1908

BY

SVEN HEDIN

VOL. VII

HISTORY OF EXPLORATION IN THE KARA-KORUM MOUNTAINS

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PREFACE

Already in the Preface to Vol. I of this work I have expressed my sincere thanks to those gentlemen and scholars who assisted me in different branches of science, when Vols. I, II, III and V with maps and Atlas of Tibetan panoramas were elaborated, more especially my collaborators Professor ANDERS HENNIG, Professor NILS EKHOLM, Doctor K. G. OLSSON, Lieutenant C. J. OTTO KJELLSTRÖM and Colonel H. BYSTRÖM.

In the same way I feel it as a very agreeable duty to express my deep gratitude to my collaborators in the last five volumes of this work. Part III of Vol. VI has been worked out in the most unselfish and thorough manner by Professor C. H. OSTENFELD of Copenhagen who distributed certain parts of my botanical collection to other specialists, *vis.*, Flowering Plants to Dr. L. DIELS, Dr. H. HARMS, Dr. R. PILGER and Dr. E. ULBRICH of Berlin, and to W. B. HEMSLEY and H. H. W. PEARSON of Kew;—Algæ to Professor N. WILLE of Christiania; Diatoms to F. HUSTEDT of Bremen and, finally, Mosses to Dr. V. F. BROTHÉRUS and Dr. N. BRYHN.

To the last chapter of Vol. VII, dealing with the Trigonometrical measurements of the highest peaks of the Transhimalaya I have had very valuable assistance by Professor KARL D. P. ROSÉN and Colonel BYSTRÖM.

As to my collaborators in the last volumes of Southern Tibet I will have to return to them in the Preface to Vol. VIII.

* * *

The last sheet of this volume was already printed when STEIN'S standard work *Serindia* appeared. KOSLOFF is said to have published a new book on Tibet. Dr. EMIL TRINKLER of Munich has written a monographic description of Tibet which will be printed in *Zeitschrift der Geographischen Gesellschaft*, München. It is very well done and must be warmly recommended to students of the geography of High Asia. I have read it in type; its title is: *Tibet, sein geographisches Bild und seine Stellung im asiatischen Kontinent*.

Stockholm, November 28, 1921.

SVEN HEDIN.

HISTORY
OF EXPLORATION IN THE
KARA-KORUM MOUNTAINS

HISTORY
OF THE
RELIGIOUS
AND
MORAL
STATE OF THE
CITY OF
NEW-YORK
FROM
THE
FIRST
SETTLEMENT
TO
THE
PRESENT
TIME

CHAPTER I.

ANCIENT TRAVELLERS.

In Vol. III of this work I have collected all the scanty material about the eastern and western parts of the Transhimalaya so far as this great orographical system was known before my journey in 1906—1908. In the latter half of the same volume I described the eight lines on which I crossed the central parts of the Transhimalaya, as well as my journey along the central lakes which form a latitudinal depression at the northern base of the same system. Vol. IV is to be regarded as a direct continuation of Vol. III as it contains the rest of my last journey in Tibet.

In the present volume I am going to give the history of exploration in the Kara-korum Mountains.

This gigantic system, which possesses some of the highest peaks on the earth, makes its appearance earlier in history than the central parts of the Transhimalaya, and still less than a century has passed away since the Kara-korum was looked upon as a special mountain system. I will follow the same method as in Vol. I, where I proceeded from general, in the beginning very vague, notions about the geography of Central Asia to an uncertain idea of Tibet which in the course of the last two centuries, by and by developed into a more and more detailed and correct knowledge of this country. As regards the Kara-korum, I will have to go back to the very first narratives in which we are able to trace, if not the existence of a great mountain system, at least that of a comparatively broad belt of mountainous land between Eastern Turkestan and India. In connection with the earliest information I will, at a few places, have to return to travellers and cartographers who have been dealt with already in the first three volumes of this work. This is sometimes necessary for the continuity of the history of exploration. It will be the case more especially so far as Vol. III is concerned, and could not be avoided, remembering the intimate connection between the Transhimalaya and the southern Kara-korum.

In the first chapters of this volume, which, as I have already said, are of a more general character, I will also at a few places touch upon regions which do not belong to the Kara-korum, but which should not be missing in a historical account.

Thus I have also inserted in these first chapters some information that has come to my knowledge since the first volumes were printed, and such information as has been published in the last four or five years. Approaching our own time my attention will be concentrated more and more upon the Kara-korum Proper, and having dealt with the recent exploration in the glacier region of the western-most part of the system, I will finally make an attempt to show in how far the Kara-korum and Transhimalayan Systems may be said to belong to one and the same gigantic system of folds in the earth's crust.

In the first chapter of Vol. I of this work, I have made an attempt to show, by a few examples, how very scanty and uncertain the real geographical features are which may be drawn out of the epical songs and other works of Sanskrit literature regarding the mountains to the north of India. As the result proved to be very poor when dealing with the whole world of mountains to the north, we could indeed not expect to find the slightest hint of the existence of the Kara-korum System which is only a part of the whole. Mount Kailāsa, which from a general point of view may be said to belong to this system, was the single part of it that we found mentioned in many of the poetical works of the ancient Hindus. But, on the other hand, when, according to Hindu conception, Mount Meru or Sumeru is regarded as the centre around which the four continents, amongst which is Jambudvīpa or India, are situated, it may also, from a very generalizing point of view, be said that Mount Meru includes the Kara-korum as well as all other mountain systems belonging to the Tibetan highlands.¹ But it is superfluous to add that the Kara-korum in reality was a perfect stranger to the geographical conception of the Hindus, and that even the Himalaya and the Kailāsa, and in a still higher degree the Meru, to the mind of the Hindus first of all, were poetical conceptions with, it is true, a background of real knowledge. The real knowledge of the geography of High Asia may be said to cease with the Kailas, north of which the *terra incognita* began.²

¹ In Dr. O. FRANKE's work on Jehol I find the following interesting passage regarding the temple Hsü-mi fu-shou miao in Jehol: »Was den Namen anlangt, so ist Hsü-mi (alte Leute: Su-mei) eine Verstümmelung von Hsü-mi-lou oder Su-mei-lu, und dies ist eine Umschreibung des indischen Sumeru, des Namens jenes mythischen, 3360000 Li hohen Berges, der sich mitten aus dem Meere erhebt und der auch in der nicht-buddhistischen Sanskrit-Literatur eine Rolle spielt. Im Tibetischen heisst derselbe Hlunpo....» *Beschreibung des Jehol-Gebietes*, Leipzig 1902, p. 56. The name Lunpo or Hlunpo we remember from one of the highest ranges of the Transhimalaya (Cp. the coloured panoramas, Vol. III, p. 318—319). Lunpo-gangri would thus mean the Sumeru Mountains, and the Sumeru would in this case practically be the same as the eastern continuation of the Kara-korum System.

² LASSEN says of the mountains Kailāsa and Gandhamādana: »Diese Berge bezeichnen in dieser Richtung die Gränze der wirklichen Kenntniss, denn über die Einsiedelei des Rāgarshi Arishtishēna hinaus ist es dem Menschen nicht erlaubt zu gehen.« — E. T. ATKINSON says: »Meru in its widest sense embraces the elevated table-land of Western Tibet between Kailās on the east and the Muṣṭāgh range on the west and between the Himavat on the south and the Kuen-lun range on the north.« *The Himālayan Districts of the North-western Provinces of India*, Allahabad 1884, Vol. II, p. 290.

Before leaving this field, from which we have nothing to gain regarding our mountain system, I will only insert a quotation giving an idea of the poetical garb in which the mountain giants north of India were dressed in Sanskrit literature. It is the beginning of the first Canto of KALIDASA'S poem *The Birth of the War-God*:¹

Far in the north Himálaya, lifting high
His towery summits till they cleave the sky,
Spans the wide land from east to western sea,
Lord of the hills, instinct with deity.
For him, when Prithu ruled in days of old,
The rich earth, teeming with her gems and gold,
The vassal hills and Meru drained her breast,
To deck Himálaya, for they loved him best;
And earth, the mother, gave her store to fill
With herbs and sparkling ores the royal hill.
Proud mountain-king! His diadem of snow
Dims not the beauty of his gems below.

And, indeed, there is very little reality in the following picture of the Meru, Second Canto, where it is said of Indra:

He roots up Meru's sacred peaks, where stray
The fiery coursers of the God of Day,
To form bright slopes, and glittering mounds of ease
In the broad gardens of his palaces.

In Canto Seven, finally, it is said of Nandi's bull:

Whose broad back covered with a tiger's hide
Was steep to climb as Mount Kailása's side.

It is, however, very probable that the Kara-korum Proper was known to a certain extent in some quarters of Ancient India. The missionaries who spread Buddhism to Eastern Turkestan and China, penetrated into the heart of the continent by roads that cross the Tibetan highlands where these are at their narrowest, viz., to the north-west of India, and which, therefore, at least the eastern ones of them, have to cross the Kara-korum System. But of these Buddhist crusades we have no knowledge.²

¹ RALPH T. H. GRIFFITH in *The Birth of the War-God, a Poem by Kalidasa*, Second Edition, London 1879, p. 1.

² ADEL-RÉMUSAT says: «Le Tibet et le Japon ont aussi reçu de l'Inde cette même religion de Bouddha, ce culte voyageur, qui a parcouru le continent et les îles, policé les pasteurs des vallées de l'Himalaya et les cavaliers du Turkestan, et fondé des monastères et des bibliothèques sur les pics inaccessibles du Tibet et dans les déserts sablonneux de la Tartarie.» *Mélanges posthumes d'histoire et de littérature orientales*, Paris MDCCCXLIII, p. 237. — RENAUD gives the following statement: «Des avant notre ère, le bouddhisme franchit l'Himalaya et l'Hindoukouch, et se répandit en Tartarie, d'où il pénétra en Chine.» — *Extrait d'un Mémoire... sur l'Inde. Nouv. Annales des voyages*, Paris 1846, Tome III, p. 145. — To this may only be added the following words of T. W. RHYS DAVIDS: «Buddhism had long before this (2nd century of our era) penetrated to China, along the fixed route from India to that country, around the northwest corner of the Himalayas and across Eastern Turkestan.» In the

CUNNINGHAM reminds us of the fact that the geographical information collected by ALEXANDER and his companions, and by the subsequent embassies and expeditions of the Seleucide kings of Syria, was confined to the Indian peninsula. Only by the systematic inquiries of PTOLEMY, this information was considerably extended.

He regards the geography of Ptolemy the more valuable as it comes in midway between Alexander and HÜAN-CHUANG.¹ Ptolemy's map is, at any rate, the first on which a representation — not of the Kara-korum, but at least of its nearest neighbour to the south, the Paropanisus Mons, is to be found.²

The famous medieval travellers who visited the court of the Great Mongol Khans, have, of course, a very vague idea of the mountains farther south. If they mention them at all, they usually rely upon the information given by classical geographers. According to ROCKHILL, ISIDORUS was the geographical guide of RUBRUCK, and Isidorus says: »The Mons Caucasus extends from India to the Taurus; and on account of the diversity of peoples and languages, it is called by different names in different places». Rubruck tells us that »the Iugurs lived amidst the mountains to the south». Having mentioned the people Tebet, the Seres, Cathayans and Moal or Mongols, the famous friar adds: »All these nations are in the mountains of the Caucasus, but on the north side of these mountains, and (they extend) as far as the eastern Ocean, and (this is) also to the south of that Sithia which the pastoral Moals inhabit, and whose tributaries they all are».³

Rubruck's great forerunner, the Friar JOHN OF PIAN DE CARPINE, has not even so much to say of the mountain systems to the south, though he mentions Burithabeth or Tibet in the passage quoted above.⁴

second year B. C., an embassy took Buddhist books to the emperor of China. — *Buddhism*, London 1903, p. 241. According to Prof. A. CONRADY there existed already in the fifth century B. C., if not earlier, a commercial intercourse between the inhabitants of the Tarim Basin and India. P. 161 of Conrady's work on my Lou-lan MSS. This intercourse must obviously have taken place across the western Kara-korum System or the ranges situated still farther west and being the continuation of the Kara-korum.

¹ *The Ancient Geography of India*, London 1871, p. VII.

² *Vide* Pl. III, Vol. I.

³ W. W. ROCKHILL, *The Journey of William of Rubruck to the Eastern Parts of the World*, 1253—55. London MDCCC, p. 157.

⁴ Vol. I, p. 134, where I have also, after Rockhill, quoted the view of D'AVEZAC regarding the meaning of the name Burithabeth. The latter expresses his opinion in the following passage: »Buru-Thabet ou Buri-Thabet, qui est bien certainement le Tubet, ainsi qu'on en trouve la preuve dans Rubruk et Oderic, qui racontent de celui-ci la même particularité que Jean du Plan de Carpin rapporte du premier, savoir, que les habitants ont la singulière coutume de manger leurs parents après leur mort. Au surplus le nom de Bouri-Tibet se trouve lui-même employé par Reschyd-el-Din, concurremment avec celui de Tibet. Et comme on voit, dans Constantin Porphyrogénète, une même tribu de Patzinakes ou Petcheneg désignée concurremment par les noms de Talmat et de Boro-Talmat, on peut soupçonner que le mot Buru, Buri ou Boro est un spécificatif qui n'altère point la signification du nom auquel il est joint. Il se représente dans Boro-Tala, plaine voisine des lacs Khaltar et Alaktou dans la Dzungarie. Peut-être n'est-il pas hors de propos de remarquer aussi que le mot Baron, signifiant la droite, c'est-à-dire le sud, est donné par les Mongols au Tubet lui-même, sous cette

In Chapter XXXII of his narrative where MARCO POLO describes »the Great River of Badashan», the wild sheep and other things, he also mentions two names which, in later centuries, and still in our days, would become very famous: Pamir and Bolor. Sir HENRY YULE calls this chapter »one of the most interesting in the book», and a »splendid anticipation of modern exploration», an opinion with which everybody who has visited these regions will heartily agree.

Marco Polo, of course, cannot have any knowledge of the Kara-korum, but he has, at any rate, passed very near the northern slopes of its ramifications on his way eastwards. He knows Badakhshan, Syghinan, Vokhan, Pamier, Bolor and Pashai, and he has heard of Keshimur. But the gigantic mountains between Bolor and Keshimur were a *terra incognita* to him and would remain so to Europe, for some five hundred years more.

The great traveller's own words run as follows:

The plain is called Pamier, and you ride across it for twelve days together, finding nothing but a desert without habitations or any green thing, so that travellers are obliged to carry with them whatever they have need of. The region is so lofty and cold that you do not even see any birds flying. And I must notice also that because of this great cold, fire does not burn so brightly, nor give out so much heat as usual, nor does it cook food so effectually.

Now, if we go on with our journey towards the east-north-east, we travel a good forty days, continually passing over mountains and hills, or through valleys, and crossing many rivers and tracts of wilderness. And in all this way you find neither habitation of man, nor any green thing, but must carry with you whatever you require. The country is called Bolor. The people dwell high up in the mountains, and are savage Idolaters living only by the chase, and clothing themselves in the skins of beasts. They are, in truth, an evil race.

These words of Marco Polo, describing his journey across the Pamirs, are classical. From a geographical point of view, there is very little exaggeration in it. The plain of Pamier is what STRAHLENBERG, in 1730, called Planities Pamer on his map.¹ The great Venetian has been riding through uninhabited mountain desert for 12 days, after which he continued for another 40 days through mountainous regions, which seems, indeed, to be rather slow riding. This country is called Bolor. Even his observation that food does not cook sufficiently is correct, which is more especially the case with the rice. In the same chapter he has been talking

forme Baron-Tala, par opposition au Dzen-Tala ou côté gauche, c'est-à-dire la Mongolie. — *Relation des Mongols ou Tartares par le Frère Jean du Plan de Carpin*, etc. Paris 1838, p. 168. — As Rubruck heard the name Tebet only a few years later, it is probable that Friar John also has heard it, and that his Burithabeth is a combination of Baron and Tebet. — PRSHEVALSKIY is the first modern traveller who gives us a more detailed description of the two Mongol districts of Tsaidam, each under one prince, and called Barun-sasak and Dsun-sasak. He mentions them already on his first journey (*Mongolie et Pays des Tangoutes*, Paris 1880, p. 239), but enters more in detail in the description of his third journey.

¹ Vide Vol. I, Pl. XLIX.

of »Badashan» and of his journey from »this little country» to the Pamier. And he has given a splendid description of the wild sheep that still carries his name. As to the discussion regarding the road taken by Marco Polo when crossing the mountains which are the neighbours of the Kara-korum, I have to refer the reader to Vol. VIII of this work.¹

Years ago I explained my hypothesis that the Tang-la in the far east of Tibet, belongs to the same great system of folds as the Kara-korum.² From the northern side of the Tang-la System, one of the principal feeders of the Yang-tse-kiang, the Murui-ussu or Murus-ussu takes its origin. This river, which was crossed by PRSHEVALSKIY, had already been made famous by Father HUC on his memorable journey in 1844—1846.³ If my assumption that the Tang-la is the continuation of the northern fold of the Kara-korum is correct, Huc has crossed the whole eastern part of this system, for, as shown in Vol. III, p. 158 *et seq.*, he has also crossed the eastern regions of the Transhimalaya. The reason why I mention him in this connection is that Marco Polo seems to have had some knowledge of this river, or at least have heard its name. The place in Marco Polo alluded to, runs as follows:

»After riding those ten days you come to a river called Brius, which terminates the province of Caidu. In this river is found much gold-dust, and there is also much cinnamon on its banks. It flows to the Ocean Sea.»⁴ To this Sir Henry Yule has the following explanatory note: »The name given to the river, in this part of its course, is (Mong.) Murui-ussu, or Murus-ussu, the Winding Water, and (Tib.) Di-chu, or Bhri-chu, the River of the (tame) Yak-Cow, from one or the other of which, Marco Polo seems to have taken the name Brius, which he gives to the river in Yun-nan.»⁵

This river Murui-ussu or Bri-chu, Dre-chu, Di-chu, which, according to Huc, is also called Polei-Tchou, or River of the Lord by the Tibetans, has also been mentioned by ORAZIO DELLA PENNA, who knew it from information given by SAMUEL VAN DE PUTTE, and styled it as »un grandissimo fiume, chiamato Bic'iu».⁶ KLAPROTH has identified this Bic'iu with the Bri-chu or Murussu.⁷

In Vol. I, Chapter IV, I have dealt with the Arabian geographers and their knowledge of Tibet. To what I quoted there regarding the remarkable journey of

¹ Yule: *The Book of Ser Marco Polo*. Third Edition. Vol. I, London 1903, p. 171 *et seq.* — Cf. my Vol. VIII, and map.

² *Scientific Results* . . . Vol. IV, p. 545, 575, 596, 605 *et seq.*, and map, Pl. 69 *ibidem*.

³ Huc says of it: »Nous quittâmes la grande vallée de Bayen-Kharat, pour aller dresser notre tente sur les bords du Mourouï-Oussou. Vers sa source, ce fleuve magnifique porte le nom de Mourouï-Oussou (eau tortueuse); plus bas, il s'appelle Kin-Cha-Kiang (fleuve au sable d'or) . . . » *Souvenirs d'un voyage* . . . Tome II, p. 219.

⁴ Yule: *Marco Polo*, Vol. II, p. 56. *Vide also note p. 67 ibidem.*

⁵ Introductory Essay in *The River of Golden Sand* by Capt. William Gill. London 1880, p. [33].

⁶ *Vide* Vol. III, p. 25 *supra*.

⁷ *Nouv. Journ. Asiat.* Tome XIV, p. 177 *et seq.*

IBN BATUTA, the following extract should be added, as it contains his description of the passage of the Hindu-kush, which is, at any rate, in the neighbourhood of the Kara-korum. It was in 1333 that he, coming from Khorassan and Kabul, crossed the Hindu-kush:

Un autre motif de notre séjour fut la crainte de la neige; car il y a au milieu de la route une montagne nommée Hindou-Couch, c'est-à-dire, qui tue les Indous, parce que beaucoup d'entre les esclaves mâles et femelles que l'on emmène de l'Inde meurent dans cette montagne, à cause de la violence du froid et de la quantité de la neige. Elle s'étend l'espace d'un jour de marche tout entier. Nous attendîmes pour la passer l'entrée des chaleurs. Nous commençâmes à traverser cette montagne, à la fin de la nuit, et nous ne cessâmes de marcher jusqu'au soir du jour suivant. Nous étendions des pièces de feutre devant les chameaux, afin qu'ils n'enfonçassent pas dans la neige.

Of a certain Mohammed, Al-Mehrouï, he says:

Il nous accompagna jusqu'à ce que nous eûmes passé la montagne d'Hindou-Couch. Nous trouvâmes sur cette montagne une source d'eau chaude, avec laquelle nous nous lavâmes la figure. Notre peau fut excoriée et nous souffrîmes beaucoup. Nous nous arrê tâmes dans un endroit nommé Bendj-Hir. Bendj (Pendj) signifie cinq, et Hir, montagne. Le nom Bendj-Hir veut donc dire cinq montagnes. Il y avait là une ville belle et florissante, sur un fleuve considérable et dont les eaux sont de couleur bleue, comme celle de la mer. Il descend des montagnes de Badakhchan, ou l'on trouve le rubis que l'on appelle balakch. Nous partîmes ensuite pour Pervan....¹

In the following way, Ibn Batuta describes the situation of Tibet in relation to Himalaya. He has arrived at the city of Bidjnaour, and thence to the little city of Amrouhâ, from which he proceeds to the river Serou (?), which is dangerous of approach, and the water of which nobody drinks.

La raison en est qu'il descend d'une des montagnes Karatchil (Himalaia), où se trouvent des minières d'or, et qu'il passe sur des reptiles venimeux; tous ceux qui ont bu alors de son eau en sont morts. La montagne ci-dessus s'étend en longueur l'espace de trois mois de marche et au bas se trouve le pays de Tibet, qui possède les gazelles donnant le musc.²

In early geographical works and narratives, the mountains do not play any very prominent part. Even Marco Polo pays very little attention to them. More

¹ DEFRÉMERY: *Voyages d'Ibn Batoutah dans la Perse et dans l'Asie centrale*. Nouvelles annales des voyages. 1848. Tome troisième, p. 77. — In the version of the Rev. SAMUEL LEE, translated from the abridged Arabic manuscript copies preserved in the public library of Cambridge, the passage about the Hindu-kush runs as follows: «After this I proceeded to the city of Barwan, in the road to which is a high mountain, covered with snow and exceedingly cold; they call it the Hindu-Kush, i. e. Hindoo-slayer, because most of the slaves brought thither from India die on account of the intenseness of the cold. After this we passed another mountain, which is called Bashâi.» (*The Travels of Ibn Batuta*; etc. London 1829, p. 97.) Sir Henry Yule believes he has travelled by Anderab, his Andar, and by Panchshir to Parwan and Charekar, his Charkh. His Mountain of Pashai would be the Pascia of Marco Polo. Yule seems to agree with PAUTHIER that the latter must be a part of the Kafir country of the Hindu-kush. — *Cathay*.... Vol. IV. London MDCCCXVI, p. 9. Vide also Yule's *Marco Polo*. Vol I, p. 164—166 note.

² *Voyages d'Ibn Batoutah. Texte arabe, accompagné d'une traduction par C. Deffrémery et le Dr. H. R. Sanguinetti*. Tome III, Paris MDCCCLV, p. 437.

than a hundred years after the great Venetian, the Bavarian adventurer, JOHANN SCHILTBERGER, had some extraordinary experiences in the interior of Asia, and in his narrative he at least mentions some mountains which are not very far from the system now occupying our attention. He was probably born in 1381, left his home in 1394, served in the army of Sultan Bayazed in 1396—1402; from 1402 to 1405 he accompanied Timur on his campaigns.

Amongst other things he relates in his narrative, is Timur's campaign against »clein india»,¹ of which he says:

»Das ligt von siner hoptstat (Samarkand) vier monet tag weid. Und nach der zit zoch er hiny in das clein India mit vier hundert tusent mannen und zoch durch ein wüst, die ist zweintzig tag weid lang. Da ist grosser mangel an wasser vnd kam dornach an ein gepirg. Da zoch er acht tag ee er doruss kam. Und in dem gepirg ist ein weg da must man die kamel vnd die ross vff bretter binden vnd musts abhin laussen. Dornach kam er in ein tal, da ist es als finster das ainer den andern nit wol gesehen mocht by liechtem tag, das weret vff ain halbe tagweid. Dornach kam er in ein hochs gepirg. Da zoch er dry tag und dry nächte Inn. Und kam dornach vff ein schönen eben; die ligt vor der hoptstat des landes²

The passage of half a day's journey is the famous Iron Gate, passed by Alexander in 328 B. C. As all other early travellers, he has no sense for mountains, he only mentions their existence. But his veracity is beyond doubt. VIVIEN DE SAINT-MARTIN says of Schiltberger: C'était un homme simple et peu lettré, mais ses récits ont un cachet de véracité qui inspire la confiance.³

Another traveller who, in 1404, made the personal acquaintance of Timur, was CLAVIJO, the ambassador of Henry III of Castile. His narrative is valuable and contains a good deal of reliable and correct geographical information. He mentions the countries with which Samarkand is in commercial connection, and has heard of India, Tartary, Cambalu, Cathay and other countries, but has not much to say of them. To Khorassan he gives a very great, but rather vague, extension: »This land of Khorassan is a great territory, which extends from Tartary to India.» He mentions the Gates of Iron in the following words—August 25th, 1404, he has arrived at a mountain:

¹ »India the Lesser extends from the Province of Champa to Mutfeld, and contains eight great kingdoms.» *Marco Polo*, Yule. Vol II, p. 424. — CLAVIJO also mentions »India the Less». *Markham*, p. 119.

² K. F. Neumann: *Reisen des Johannes Schiltberger aus München in Europa, Asia und Afrika von 1394 bis 1427*. München 1859, p. 77. There is an English Edition of this work: *The Bondage and Travels of Johann Schiltberger, a native of Bavaria, in Europe, Asia, and Africa 1396 bis 1427*. Translated from the Heidelberg M. S. edited in 1859 by Professor Karl Friedrich Neumann, by Com. J. Buchan Telfer. With Notes by Prof. P. Bruun. London, Hakluyt Soc., MDCCCLXXIX.

³ *Histoire des découvertes géographiques*, Tome II, Paris 1845, p. 61. RICHTHOFEN makes a curious slip of the pen in calling the Bavarian traveller Hans and in making him serve Timur until 1427, though the conqueror died in 1405. *Vide China*, I, p. 619.

This hill is very high, and there is a pass leading up by a ravine, which looks as if it had been artificially cut, and the hills rise to a great height on either side, and the pass is smooth, and very deep. In the centre of the pass, there is a village, and the mountain rises to a great height behind. This pass is called 'The gates of iron', and in all the mountain range there is no other pass, so that it guards the land of Samarcand, in the direction of India. These 'gates of iron' produce a large revenue to the lord Timour Beg, for all merchants, who come from India, pass this way.¹

The difficulties TIMUR encountered on his campaign in the mountains, as stated by Schiltberger, are, in a more detailed and graphic way, described by SHEREFEDDIN. Speaking of the war against the Siahpushes, he has the following vivid narrative of the hardships of the mountain passage:

Plusieurs Emirs & les Soldats laisserent une partie de leurs chevaux à Caoûc, & monterent à pied la Montagne de Ketuer, où, quoique le Soleil fût dans les Gemeaux, la neige étoit en si grande abondance, que les pieds de la plupart des chevaux que les Seigneurs y voulurent faire monter, leur tomberent; cependant il y en eut quelquesuns que l'on poussa si fort durant la nuit & la gelée, qu'on les contraignit de monter; mais le jour étant venu, & la neige se tournant en verglas, en tenoit ces chevaux sous des feutres jusqu'au soir, auquel temps on continuoît à s'avancer dans la montagne, en sorte qu'on arriva enfin au sommet & alors en renvoya le reste des chevaux, & comme les Infideles se tenoient dans détroits & des précipices, & que du haut de ces montagnes il n'y avait point de chemin pour y descendre, outre que tout étoit couvert de neige, les Emirs & les Soldats descendirent les uns avec des cordes, & les autres se touchant sur la neige, se laissoient glisser jusqu'au bas: pour Timur, on lui construisit une espece de radeau, à laquelle on attacha des anneaux, afin d'y lier des cordes longues de cent cinquante coudées: il s'assit dessus avec confiance, & plusieurs personnes du haut de la Montagne le descendirent jusques en bas, suivant la longueur des cordes, & pendant que d'autres gens marquoient avec des pioches dans la neige un lieu où l'on pouvoit se tenir ferme.

After this manoeuvre had had to be repeated five times, the conqueror accomplished the passage of the Hindu-kush. Sherefeddin speaks of the mountain of Soualec, Siwalik, or Himalaya, which he says is one of the most considerable in India stretching through two thirds of the great Empire. His description of Kashmir is interesting:

Les montagnes qui entourent ce Pays lui servent de fortifications contre les insultes de ses ennemis, sans avoir soin de les rebâtir, ni de craindre qu'elles se ruinent par le temps, par les pluies, ni par les orages.

¹ *Narrative of the Embassy of Ruy Gonzalez de Clavijo to the Court of Timour, at Samarcand, A. D. 1403—6*, Transl. by Cl. R. Markham. London, Hakluyt Soc. MDCCCLIX. — SHEREFEDDIN makes a very short mention of the Spanish embassy. Having related Timur's return to his Imperial City of Samarkand and the building of his magnificent palace, he says: «Timur s'y étant rendu, ordonna qu'on y préparât un Banquet solennel où se trouvassent tous les délices que l'homme peut désirer, & qui peuvent flatter les sens . . . ; les Ambassadeurs d'Europe furent appelés à ce grand Banquet, & eurent leur part comme les autres aux divertissements du repas, car les Casses ont aussi leur place dans la Mer.» — PETIS DE LA CROIX tells us: «Casse, est un petit Animal, gros comme un grain d'Orge, qui court sur la superficie de la Mer», and he adds that this passage shows: «le souverain mépris qu'on faisoit des Ambassadeurs d'Espagne à la Cour Zagataiennes». — *Histoire de Timur Bec* . . . Tome IV, p. 180.

Il y a trois routes qui y conduisent: celle de Corassane est tres difficile; en sorte que le transport des balots de marchandises & autres fardeaux ne se pouvant faire par là sur le dos des bêtes de charges, les Habitans accoutumés à ce travail les portent sur leurs dos pendant plusieurs journées, jusques à un lieu où l'on peut les charger sur un cheval.

La route des Indes est de la même difficulté.

Celle de Tobbot ou Thebet est plus facile; mais durant plusieurs journées on trouve quantité d'herbes venimeuses qui empoisonnent les chevaux des passans.

Ainsi Dieu a donné des défenses naturelles a ce Pays, qui exemptent les hommes d'avoir besoin ni d'armes, ni d'Armées.¹

Sherefeddin, as all other Mohammedan writers, when speaking of Tobbot or Thebet or even Tibet, always means Ladak.

One of the generals of Timur, MIRZA ISKENDER, invaded Kashgar, Yarkand and Khotan, and of this enterprise the Zafer-nameh of Sherefeddin has some interesting particulars to tell:

De Cotan à Cachgar il y a quinze journées de chemin, & de Cachgar à Samarcande il y en a vingt-cinq. Il y a à Cotan deux Rivières, Oranccach & Caracach dont les pierres sont de jaspe, que l'on porte de là aux autres Pays: ces deux Rivières ont leur source dans la montagne de Carangoutac Il (Mirza Iskender) partit ensuite de Cotan, & se rendit à Carangoutac, montagne fort haute & escarpée. Les Habitans de Cotan & des environs se refugient dans cette montagne dans les temps de guerre, & lorsqu'ils craignent quelque insulte. Après que le Mirza se fût instruit à fond de l'état & de la force inaccessible de Carangoutac, il ne jugea pas à propos d'y hasarder ses troupes²

From this passage it seems to be obvious that Sherefeddin gives the name of Karangu-tagh to the whole region of the Kwen-lun System from which the Yurungkash and Kara-kash take their origin. His words are, however, not to be taken literally. For he probably did not know where the sources of the rivers were situated, and he, therefore, probably only speaks of the northern ranges of the Kwen-lun System. Regarding the relation between the Karangu-tagh and Kwen-lun, BRETSCHNEIDER has a somewhat surprising view, saying of the latter:

The western part of it on our maps, bears the name of Karakorum mountains, south and south-east of Khotan. The Zafer-nameh terms these mountains Karangutak. I may observe that on modern maps of these regions I find a place of this name marked more than fifty English miles south of the city of Khotan, on the river Yurungkash or Karang kash, which flows to Khotan. It is also the name of a mountain district there.³

It is of course wrong to identify the western Kwen-lun with the Kara-korum. On the other hand, Bretschneider is, no doubt, right in saying that the Zafer-nameh calls those parts of the Kwen-lun that are situated south and S. W. of Khotan, the Karangu-tagh. The little village of this name is situated some 72 miles south of Khotan. Of course it would be quite wrong to suppose that the Karangu-tagh had

¹ Petis de la Croix: *Histoire de Timur-Bec* Ecrite en Persan par Cherefeddin Ali natif d'Yezd. Tome III, Delf. MDCCXXIII, p. 15, 162.

² Op. cit., Tome III, p. 219.

³ *Medieval Researches*, Vol. II, London 1910, p. 249, not. 1043.

anything whatever to do with the Kara-korum. From my visit in Khotan in 1896, I only mention the name of the village, Karangu-tagh, »at the base of the mountains». ¹ On HASSENSTEIN'S map accompanying my narrative², the mountains south of the village are also called Karangu-tagh. M. A. STEIN, who has visited both the village and the mountains around it, has a chapter: »In the Karanghu-tagh Mountains», but the name not entered on his map except for the village.³ There is no doubt that the name originally belonged to the mountains. ABEL-RÉMUSAT only mentions Karangu-tagh as a range, though he could not know the orography of these regions. He says:

Le nom de Carangoutac est pareillement turk; Karangouï tag, montagne ténébreuse; on sait que c'est le nom donné à cette chaîne qui vient de l'Himâlaya, et qui porte sur les cartes de Danville le nom de Belur, qui paraît avoir la même signification.⁴

If we have a look at early maps, we cannot, of course, expect to find any sign of the Kara-korum System on them. It may be sufficient to fix this statement with a few words. Already on the Genoese Map of the World of 1447, we find a great latitudinal range crossing the whole of Asia from west to east, and the Imaus montes inaccessibiles starting from its western end, and running to the N. E. The great features of orography are the same as on Ptolemy's map, on which, however, the range that comes nearest to the Kara-korum System, is called Paropanisus mons. The same is the case with FRA MAURO'S map of 1459, where both M. Imaus and Tebet are entered. On MARTELLUS GERMANUS' map from the end of the 15th century, we find a range of mountains with ramifications going through the whole of Asia and called by four different names: Paropanisus, Imaus mons, Emodi montes and Serice montes.⁵ NICOLAS DESLIENS, on his map of 1541, does not pay any special attention to the Montes Imani, which he represents as a group of mountains from which one of the feeders of the Ganges takes its origin.

The first map on which the influence of Ptolemy has completely disappeared, and where thus the mountains north of India, which so far had formed one single

¹ *Pet. Mit.*, Erg. Band XXVIII, Gotha 1900, p. 24.

² *Ibidem*, Bl. I.

³ *Ruins of Desert Cathay*, Vol. I. London 1912, p. 197. — Cp. his map II, Vol. II of *Ruins of Desert Cathay*.

⁴ *Histoire de la ville de Khotan*, Paris 1820, p. 151. — Rémusat believes that the name is identical with GOËS' consangui Cascio, and quotes this passage from TRIGAULT: Abest mons iste ab hâc regiâ dierum XX itinere, et consangui Cascio id est, mons lapideus appellatur, quem verisimile est eum esse qui eodem nomine in geographicis descriptionibus hujus regni quibusdam nuncupatur. YULE quotes RITTER and states that his identification of Cansanghi Cascio with Karangui-Tagh must be a mistake. — *Cathay*, Vol. IV, p. 299 note. The place in Ritter alluded to runs thus: »Den Berg mit dem Ju-Bruche nennt er (Goës) Cosanguicascio, d. i. offenbar Karangouï Kash, oder Tak.» — Ritter, *Erdkunde*, VII, p. 383. — Yule gives the single correct identification: »But the words are Persian, Kân sang-i-Kâsh, 'The mine of Kash (or Jade) stone'»

⁵ A very good résumé of the history and geography of these names has been made by Dr. ALBERT HERRMANN in Pauly's *Realencyclopädie*, Second Edition, Berlin 1920.

range from west to east, have been dissolved into many ramifications and systems in different directions, is *Tertia Pars Asiae*, by JACOPO GASTALDI, 1561. On this map there is a double, though still very narrow range, separating India from Diserto de Camul. To the west, where in reality the great Kara-korum System, the Pamirs, Badakhshan, Chitral, etc. are situated, it widens out to a fan of ranges. Instead of the classical names, we find the appellations Monte Vssonte, Monte Naugracot and Monte Dangver, the latter, though belonging to the Himalaya, most of all approaching our Kara-korum.

On GERHARD MERCATOR'S map of 1569, we find an attempt to reconcile Ptolemy with modern discoveries. The Ranges of Ptolemy may easily be recognized: the great range and its ramifications, amongst others, the meridional Imaus and the meridional range west of it. There are less traces of the Kara-korum than on Gastaldi eight years previous.

ORTELIUS, on his *Tartariae sive Magni Chami Regni typus* 1570, has marked the whole of High Asia as a long latitudinal range, Imaus mons qui & Caucasus or Monte Dalanguer and Monte Vssonte. East and S. E. of it, he has the province of Thebet. Here also M. Dalanguer, as may be seen on Pl. XXIII, Vol. I, takes us to the vicinity of the Kara-korum.

Herewith it has been stated that in the course of the 16th century, there is no sign of the Kara-korum Mountains on any European map.

CHAPTER II.

MIRZA HAIDAR.

We have dealt with MIRZA HAIDAR'S invasion of Tibet in Vol. I, p. 70 *et seq.* Here we have to return to his description of the mountains between Eastern Turkestan and India. The geography of Mirza Haidar has been thoroughly discussed by R. B. SHAW¹, of whose passages NEY ELIAS says:

They contain translated extracts from Mirza Haidar's opinions, which are fully and accurately elucidated by Mr. Shaw, according to modern knowledge of the subject and local information.² And again: »When in Yarkand and Kashghar in 1874—75, Mr. Shaw had with him, if I remember rightly, a copy of the *Tarikh-i-Rashidi*, and was thus able to criticise it on the spot with the help of native informants.³

Mirza Haidar gives a quite excellent definition of the mountainous regions which very nearly correspond to the Chinese signification Ts'ung-ling. For the sake of comparison, I enter here the most important passages of his physical geography and orography:

Balur is an infidel country (Káfiristán), and most of its inhabitants are mountaineers Its whole extent consists of mountains, valleys, and defiles, insomuch that one might almost say that in the whole of Baluristán, not one *farsákh* of level ground is to be met with.⁴

In the description of the mountains of Moghulistán and Káshghar, it was stated that the principal range in Moghulistán, from which all the other hills branch out, passes the north of Káshghar, runs towards the west, and continues to the south of Káshghar. It was also mentioned that the province of Farghána lies to the west of Káshghar, this range running between. [This part of the range] which lies between Káshghar and Farghána, is called Alái. — Badakhshan is on the west of Yarkand. These countries are also divided by [a part of] this same range, which here takes the name of Pámir. The width of the Pámir, in some places, is eight days' journey. Passing onwards, one comes to some of the Yárkand mountains which adjoin Balur, such as Ráskám and Tágh Dum

¹ *A Prince of Kashgar on the Geography of Eastern Turkestan. Journ. Roy. Geogr. Society.* Vol. XLVI. 1876, p. 277, *et seq.*

² N. Elias and E. Denison Ross: *A History of the Moghuls of Central Asia being the Tarikh-i-Rashidi of Mirza Muhammed Haidar, Dughlát.* Re-issue. London 1898, p. VIII.

³ Loc. cit., p. 296n.

⁴ Op. cit., p. 384 and 385.

Básh; proceeding yet further, one arrives in the land of Tibet. Badakhshán is in the direction of summer sunset (*tabistáni*) from Yárkand, as stated above, and Káshmir is in the direction of winter sunset (*zamistáni*) from Yárkand. That same range runs between Yárkand and Káshmir, and is here called Bálti; this [district] belongs to the province of Tibet. There is, in these parts, a mountain wider than the Alái or the Pámir. The width in Bálti is twenty days' journey. — The pass ascending from Yárkand, is the pass of Sánju, and the pass descending on the side of Káshmir, is the pass of Askárdú [From the Sánju pass to the Askárdú pass] is twenty days' journey. In the direction of winter sunset from Khotan, are some of the cities of Hind, such as Láhur, Sultánpur, and Bájjwára, and the afore-mentioned mountain range lies between. Between Khotan and the towns of Hind above-named, are situated Arduk (Rudok), Guga (Guge), and Aspati (Spiti), which belong to Tibet; and it must be supposed that those mountains extend into Khitái. On the west and south of the range, lies Hindustán; while Bhira, Láhur and Bangála are all on the skirts of it. All the rivers of Hind flow down from these hills, and their sources are in the country of Tibet All the streams which flow down from the mountains of Tibet, in a westerly and southerly direction, become rivers of Hind all the streams which flow in an easterly and northerly direction from the mountains of Tibet empty themselves into the Kuk Naur¹ From these details it will be clear that Tibet is a very highlying country, since its waters run in all directions. Any one wishing to enter Tibet, must first ascend lofty passes, which do not slope downward on the other side, for on the top the land is level; in a few cases only, the passes have slight declivities [on the far side].²

In his above-mentioned article, R. B. Shaw proves that this description is perfectly in accordance with the real state of things. He places Raskam and Taghdumbash on »the Central Asian *versant* of the Muztak (sometimes, though improperly to my mind, called Karakorum) Range, in the corner between it and Pámir.« Shaw is right in saying that Mirza Haidar possessed a faculty rare among Orientals, namely to rise above details and conceive a general idea. Everybody who in the interior of Asia has asked the natives for the name of a mountain range, will agree with Shaw in this respect. But, as shall be seen in connection with our discussion of Shaw's own journey, he had a curious conception of the orography of the Kara-korum and Kwen-lun, to which he, however, finds a certain support in Mirza Haidar's geography. »The account of the mountain region sweeping round the north, west, and south of Káshgharia, and thus enclosing that country on three sides, is the simplest and truest that can be given.« And he agrees with the Oriental writer when he regards everything between Yarkand and India as one great *mountain mass*.

To Mirza Haidar's hydrography, when he makes the rivers flow in different directions from the mountains between Yarkand and India, Shaw adds the reflection:

¹ Lop-nor. According to Mirza Haidar the »Kará Murán of Khitái« issues from »Kuk Naur«. Cp. VIGNE, who says that the Kashgar-daria, after passing Kashgar, is joined by the river of Yarkand, »whence it still flows easterly, and joins, as well as I could collect, the great Chinese river of Hoang-Ho, which is crossed in the way to Pekin. But information from natives is not much to be depended upon.« *Travels in Kashmir, Ladak, Iskardo, etc.* Vol. II, London 1844, p. 369.

² Op. cit., p. 404 *et seq.*

»Thus, in his estimation, *one* mountain-system, and not *two*, lies between the Indian and the Central Asian basin.» Mirza Haidar mentions the road from Khotan to India, and knows the intermediate stations, Rudok, Guge, and Spiti, indicating that he or his informants had been over it.

In Chapter XCIV of Part II, p. 420 of the *Tarikh-i-Rashidi*, there is an interesting description of the difficulties of the Kara-korum road represented to the Khán by those who had had experience of them: »It is now too late [in the season] to achieve anything; for very soon all the waters and rivers will be frozen over, so that no water will be obtainable: nor is there sufficient firewood to be found to melt the ice, for watering the cattle and horses. It will also be hardly possible to kill enough kutás to make a sufficient supply of soup. It is for these reasons that, on previous occasions, several armies have been dismounted [lost their horses] on this road.» The Khán, being convinced, turned back from Khotan, and advanced along the road which Mirza Haidar had taken.

Ney Elias is of the opinion that the Khán had started from Khotan with the intention of crossing by one of the direct routes to Ngari-khorsum. But these routes are »practically impassable» — »never used by traders or travellers and are very little known». Ney Elias concludes: »Mirza Haidar's route (and the one the Khan afterwards followed) was the ordinary one, over the Kara-korum pass, as is evident from Nubra being mentioned as the first point reached on arriving in Ladak.» (Ibidem, p. 420n.)

When, in 1533, Sultan Said Khan Ghazi was on his way from Máryul in Tibet (*i. e.* Leh in Ladak) back to Yarkand, he died on the road, and from that incident dates the well-known name, Daulet Bek-öldi, near Dapsang. Mirza Haidar accompanied him on his first stage¹ and then took leave of him. Four days later he got news that the Khan had crossed the pass of Sákri. »He had reached Nubra in safety and was camped there, intending to proceed towards Yárkand after the festival of the Sacrifice.» As Nubra is mentioned, the Sákri may easily be meant for Kardung-la above Leh, as Ney Elias supposes. Then they set north on their homeward road with all speed, and »crossed the ice passes (muzájat)». There is not the slightest doubt about this »muzájat» or ice-pass being the Saser-davan, though H. W. BELLEW identifies Sákri with Saser.²

The Khan was very ill, and to get him away to some more hospitable place, his followers mounted him upon his horse and made eight days' journey in four. Mirza Haidar thinks it would have been better to construct a litter. »But the armies excused themselves for not making one, on the ground that it could not be carried over the passes.» After these four days' journey, the Khan died, which must have

¹ Op. cit., p. 445.

² Vide: *Kashmir and Kashghar*, p. 168.

taken place, as Ney Elias assumes, on the Suget-davan. That it cannot have been at the present Daulet Bek-öldi, as Bellew believes, is obvious, for this place is only two ordinary marches from the foot of the Saser-davan. To me, Daulet Bek-öldi was not pointed out at exactly the same place as where Bellew has it. Bellew thinks that the journey with the dying Khan was accomplished over the Dapsang heights.

On the difficulties on his journey back from Ladak, Mirza Haidar writes¹: »I moved off finally, with twenty-seven men, [We suffered much] from want of supplies for the journey — from the weakness of the beasts of burden, from the difficulties of the road and from the cold. For although it was now the season of Virgo, the cold was so severe that at a place we came to called Kara Kuram, as the sun sank, the river (which is a large one) froze over so completely that wherever one might break the ice, not a drop of water was forthcoming.» Thus they continued to the spot where the road to Badakhshan branched off. From this description Shaw concludes that Mirza Haidar did not consider that he crossed a range here. This is right, for a native will never consider the Kara-korum Pass as being situated in a range. It is on a comparatively very low ridge placed on a wide open barren country, extremely cold and with much »dam-giri», or shortness of breath.

In Mirza Haidar's account, the historical events are of incomparably greater importance than the geography of the countries where they have taken place. Still, as we have seen from the passages quoted above, he has not neglected the geography, and he is, as far as is known, the first who has ever described the later on so famous Kara-korum road.

¹ Op. cit., p. 465.

CHAPTER III.

ANTONIO DE MONSERRATE.

In Chapter XVII of Vol. I of this work, p. 154—156, I have related the facts I was able to find out regarding the Portuguese Jesuit, Father ANTONIO DE MONSERRATE, in relation to the Sacred Lake of Manasarovar. I showed how, according to several geographical authors, Monserrate is supposed to have been the first European who had ever heard of and mentioned the name of Manasarovar. The statement obviously originated from Captain F. WILFORD in 1808.¹ Wilford's own words regarding the lake of Man-saraur run as follows: »It is noticed by P. Monserrat, who accompanied the Emperor Acbar in his expedition to Cabul, in the year 1581. He calls it Mánсарuor, and from the report of pilgrims, places it in thirty-two degrees of latitude North; and about three hundred and fifty miles to the North-East of Serhind.»

With the assistance of some of the most learned librarians in Sweden I made desperate efforts to find out some more detailed sources regarding the life and works of Father Antonio, but without success. I could only bring the most important dates of his life together with the statements given by Wilford. But as I was unable to find any confirmations of the latter's statements, I feared that he had made a mistake, and confused Monserrate with Tieffenthaler, as the latter, though nearly 200 years later, also calls the lake Mansaroar. On the other hand I say: The statement about Monserrate is so positive and so detailed that it cannot simply be dismissed as constructed by Wilford's imagination.

The manuscript to my Vol. I was written in 1912—13, and the greater part of it printed in 1914, though not published before 1917. In 1914, Rev. H. HOSTEN published, in the *Memoirs of the Asiatic Society of Bengal*, a most important and able article on Monserrate together with the first half of the Jesuit Father's own MS., which eight years before had been discovered in Calcutta. From this MS. it

¹ *An Essay on the Sacred Isles in the West, with other Essays connected with that work. Asiatic Researches.* VIII, 1808, p. 327 et seq.

has been proved that everything Wilford says of Monserrate was perfectly correct, and that nobody, except myself, had made a mistake, in supposing that Wilford should have confounded Monserrate and Tieffenthaler. I am very glad now to be able in this historical account to give Monserrate the high place and credit which is due to him.

Rev. H. Hosten gives, in his Introduction, all details regarding the discovery, in 1906 in Calcutta, of the valuable MS. of Antonio de Monserrate.¹ A note contains the principal dates of his *curriculum vitae* and references to C. SOMMERVOGEL and E. DE GUILHERMY for other details. In FR. ANT. FRANCO'S *Imagem da Virtude em o Noviciado de Lisboa, Coimbra*, M. DCC. XVII, pp. 278—301 are recommended for a full account of his life.²

Monserrate's own preface is dated Sanaa, Arabia, Jan. 7th 1591. Hosten concludes that the MS. is not a copy, but Monserrate's own original, written in his prison at Sanaa.

There are 140 folios, numbered on the recto. The Calcutta MS., as is evident from the preface and an inspection of the contents, constitutes only a small portion of Monserrate's writings.

Hosten shows that the »Bk. I», as he calls the volume first discovered and now published, was accompanied by a Bk. II, containing geographical and antiquarian matter, which »remains to be discovered». Much of the contents of the intended,

¹ Rev. H. Hosten, S. J., *Jesuit Letters and Allied Papers on Mogor, Tibet, Bengal and Burma. Part I Mongolicae legationis commentarius or the first Jesuit Mission to Akbar by Fr. Anthony Monserrate, S. J. Memoirs of the Asiatic Society of Bengal*, Vol. III, No. 9, pp. 513—704, Calcutta 1914.

² VINCENT A. SMITH is perfectly right in his high opinion of the Jesuit Fathers. In his admirable book on Emperor Akbar, published a few years ago, he says: »The Fathers were highly educated men, trained for accurate observation and scholarly writing. . . . The long-lost and recently recovered work by Father Monserrate, entitled *Mongolicae Legationis Commentarius* (1582), is an authority of the highest credit and importance, practically new.»

Of Monserrate's life Smith gives us the following particulars: Father Antonio Monserrate was a Catalan Spaniard. Together with Ridolfo Aquaviva he landed at Goa and came to Akbar's court. In 1582 he returned to Goa where he stayed till 1588 when he was ordered to Abyssinia. But on his way he was taken prisoner by the Arabs and kept for 6½ years. »When deputed to Akbar's court he had been appointed by the Provincial of Goa as historian of the Mission. He carried out conscientiously the duty imposed upon him, and wrote up his notes each night. After his return to Goa he arranged his materials, and while confined by the Arabs was permitted to complete his literary labours. He was ransomed in 1596. . . . Monserrate's principal work, entitled *Mongolicae Legationis Commentarius*, which had been long lost, and was not recovered until 1906, is of special importance as being, 'the earliest account of Northern India by a European since the days of Vasco da Gama', and also as including the fullest description existant of Akbar's successful campaign against his brother of Kābul in 1581. The author, who was then tutor to Prince Murād, accompanied Akbar as far as Jalālābad on the road to Kābul. . . . Monserrate's writings dealing with the geography, natural history, manners, and customs of India have not yet been found, but may be hidden in some European library. The map of Northern India which he prepared on the basis of astronomical observations is attached to the *Commentarius*, and is of much interest as the earliest European map of India since the time of Ptolemy and Eratosthenes.» — Vincent A. Smith: *Akbar the Great Mogul 1542—1605*. Oxford 1917, p. 7, 171 *et seq.*

and probably lost Bk. II are, however, to be found in Bk. I, which, therefore, is all the more valuable. Captain Wilford's quotations in his articles in the *Asiatic Researches*, do, as Hosten proves, not refer to the Calcutta MS., now published, but to »Bk. II» now lost. Hosten, therefore, concludes that Wilford had in his possession the original of Monserrate's Book II. Every Asiatic student will heartily agree with Rev. Hosten, in his saying: »It is not impossible that Wilford's MS. should still come to light. Judging from the extracts made by Wilford, we may say that the importance of such a discovery cannot be overrated.»

Hosten says farther¹:

»From fol. 2^b to fol. 4^b we have in the MS. a double column of names of towns, rivers, mountains and countries passed through by Monserrate in the course of his travels. The longitudes and latitudes are all given, and a quite scientific map drawn to scale — the earliest known for portions of India so far north as Lahore and Kabul, and a marvel of accuracy for the time — appears on the recto of the extra leaf marked 5.» To this wonderful map we shall have to return presently.

A mysterious annotator whom Hosten signifies with an X, has, at some already distant date, seen the precious MS. and added some remarks. He seems to have been a learned Englishman, but he cannot be identified.

Everybody interested in the history of exploration in India and other parts of Asia, will feel the sincerest gratitude towards Rev. Hosten for the excellent work he has begun, and we have to look forward to new important publications by him. Speaking of the difficulties of translating Monserrate's Latin text, he says: »Besides, so many unpublished materials on the Jesuit Missions in Mogor, Tibet and Bengal, of which not a few will farther elucidate the present work, have now accumulated under my hands that even a long lifetime will scarcely suffice to dispose of them all.»

Regarding the Latin text now published, Rev. Hosten says:

My conclusion, then, is that Monserrate's Bk. I has never been made use of. The Calcutta MS. is a unique copy, nor will the epithet 'excellent', which Graf von Noer applied to a much inferior composition by Monserrate, be found exaggerated. In presenting it to the learned world, I anticipate that his *Mongolicae Legationis Commentarius*, the earliest known account of Northern India by a European since the days of Vasco da Gama, will take rank as a first-rate authority.

Rev. Hosten may be quite sure that the high praise he gives Monserrate's text is by no means exaggerated. It is extremely interesting to read, and it is like a clear light of real knowledge in the general darkness of those early days. In this connection, though dealing with the history of exploration in and round the Kara-korum Mountains chiefly, his name should not be missing. He has not heard of this great system, it is true, but he has surprisingly correct information about

¹ Op. cit., p. 528.

regions in its immediate vicinity, and on his map he has sketched mountain ranges which could easily be regarded as belonging to the Kara-korum.¹

Before entering in a more detailed way upon the question of Monserrate's information regarding the Manasarovar Lake, I will quote a few passages of his text which seem of particular interest to me. In his narrative of the Kabul campaign of Akbar, 1581—1582, Monserrate gives the following short description of the River Satlej:

Atque inde Machiuáram, id est, piscium uicum praeteruectus, ad ripam Satanulgae, qui ab antiquis, Zarādrus dicitur, dum ligneus pons construitur, castra posuit. Cuius quidem fons, et caput, haud multum, ab eo loco distat. Nam ad Imaum proxime, exercitum Rex duci imperauerat. A quo Zaradrus, uersus ocasum solis fluit: et Indo, se immiscet.²

He calls the Satlej Satanulga, the Zaradrus of the Ancients. X, *i. e.* the unknown annotator, has written Satanledge in the margin. Machiuára, by X called Mutchy-wára, now Machawara, is situated in Ambala on the Satlej, only a few miles from where the river issues from the mountains and the Hill States, some 20 miles above Ludhiana. On Monserrate's map both »Machiwara» and »Ludiana», and Serind, Sirhind, are entered. In his text he says that the source and origin of the river is situated not far from Machawara, proving herewith that he had no idea of the situation of the real source of the Satlej, which also is proved by his map, where he puts the beginning of the river in the midst of the Himalaya. For this system he uses the classical name, Imaus. The Emperor had ordered the army first to march to the Himalaya, *i. e.* to the foot of the hills. From there the Satlej flows towards the west and joins the Indus, which is indeed correct. In this short description not a word is said of the Manasarovar as the source of the river. We shall return to his view on the hydrography in connection with the discussion of his map.

He gives a description of the natives and gives the following statement which also may be said to be correct:³

Supra eam arcem (Nagarkot), ad orientem solem, in interiori Imao, immanis, et barbara, Bothorum, vel Bothantum natio, per contubernia, sine rege, in pagis degit qui lanae coagmentum, quale est petasorum, corpori, quam proxime possunt, suendo annectunt; . . .

Thus east and above Nagarkot there lives, in tent communities, a numerous and wild people called Both or Bothant, in which we easily recognize the Tibetans. His statement »in the interior of Himalaya» is not to be taken literally, as the whole mountainous country to the north of India was supposed to be the Imaus, the breadth of which was unknown. He then says a few words of the snows of the Himalayas:

¹ Probably Akbar and his Court had no knowledge of the Kara-korum either. In a letter of 1595 the Emperor just mentions the mountains north of Kabul saying: »nous poussâmes notre voyage jusque'aux limites extrêmes des montagnes de Cachmir et du Tibet». *L'Empereur Akbar*. Par le Comte F. A. de Noer. Trad. de l'allemand. Paris 1877. Vol. II, p. 208.

² Op. cit., F. 59 a. 4.

³ Op. cit., F. 60 b. 3.

Niubus, a descensu Imai, in agrum Indicum, arcentur toto anno, praeterquam mensibus, Junio, Quintili, Sextili, atque Septembri, quibus niues, propter solis uehementes, in ea regione, ardores, soluuntur Ferunt uero, a Nagaris arce, uersus Septemtrionem, ad Casprios usque. Imai iuga, hanc gentem obtinere: atque idiomate proprio uti.¹

Thus the natives are hindered by the snow sin descending from the Himalayas to the Indian land during the whole year, except the summer months, during which the snows in these regions are melted by the glowing heat of the sun. He has been told that the Tibetans occupy the Himalayan ranges the whole way from Nagarkot northwards to the Caspirians and that they have their own language.

The MS. of Monserrate is so full of observations and statements of the most absorbing interest that it is difficult to give an idea of it. One feels tempted to quote everything. I have picked out only a few geographical problems which are directly connected with the object of my own work. Therefore, the following passage, which is only a part of what he has to say of the Indus, has to be quoted:²

Jam uero Indus, omnium est maximus, totius Indiae fluuiorum. Nam in ipso sui ortu, et capite, maximam aquarum uim, ex niubus praecipue Imai, seu Caspi montis, liquatis, defluentem accipit. Deinde quinque maximos fluuios, supra commemoratos, suo alueo excipit, et in mare deducit. In eius littore, prope fontes, auri optimi, et nitidissimi magnam copiam, qui uicini sunt populi, expiscantur. Ex angustijs montium, et conuallium Imai, supra Caspiriam, et Casiriam, atque adeo Bothorum, uel Bothantum regionem ad septemtriones, uarijs flexionibus, in planitiem, ab ortu uersus occasum flectens

The Indus, in other words, is the largest river of India, for already at its source and origin it receives a tremendous volume of water flowing down from the melting snows of the Imaus, or Caspus mountain especially. Herewith he shows that he places the source of the river at a great distance from the region where it is really situated.

He, however, after having enumerated the five tributaries, mentions the great quantities of the best and most splendid gold that is dug out by the peoples living in the neighbourhood of the banks of the river near its sources. By these words he proves that he has information of a very large portion of the upper course of the Indus, and as a matter of fact, the latter is entered on his map so far up into the mountains as to a point situated at no great distance west of Lake Manasarovar. It is indeed surprising to find such a deep perspicacity at so early a date! In the history of Asiatic exploration we have to proceed some 250 years to find anything that could be compared with Monserrate. Between him and the other Jesuit Father, TIEFFENTHALER, there intervene two centuries of ignorance regarding the Manasarovar, disregarding DESIDERI, whose MS. was found only a few years ago.

He also quite correctly states that the river, coming from the narrow passages of the mountains and valleys of the Himalayas, above Caspiria and Casiria, and

¹ Op. cit., F. 61 a. 3 and F. 61 b. 3.

² Op. cit., F. 68 b. 3, 4.

even the regions of the Boths or Bothants to the north, reaches the plains in several bends and windings, flowing from east to west, — and finally he describes how it flows out into the sea. He also tells us that by the ignorant people of this region, the Indus is usually called Nilab, which in Persian means blue water, for the river has a blue colour on account of its depth in its course from the narrow passages to the Paropanisadae.¹ I do not know how far back the name Nilab may have been in use, nor whether it existed at all in old Persian.² But if it did, Arrian's words of Alexander, when standing on the bank of the Indus: »Nili se caput reperisse arbitrabatur«, have an additional signification.³

Kashmir is familiar to Monserrate. He even explains the etymology of its name. Still more surprising and interesting is his paragraph (F. 76. b. 4. and F. 77. a. 1. *et seq.*) about the countries to the west of the Indus. He even mentions the Xacattaci or Mongoli, the Jagatai.

His orography of Afghanistan may well be said to be some 200 years before his time. He has just spoken of Kabul, which is famous on account of two circumstances:

[As being the metropolis of a kingdom, and] — alterum, negotiatorum celebritas: qui ex India, Persia, et Tartaria, in eam conueniunt. Est enim, in ipsis illorum montium, ueluti uisceribus, aut corde posita qui ueluti, brachijs quibusdam, in uicinas regiones, iniectionis, Indiam, Sogdianam, Bactrianam, et Tartariam, attingunt.⁴

Hi sunt Caucasius Imaus, qui etiam Caspus. Paharopanisus, et Paharuëtus, quorum medius, Caucasius est. In eius fronte Chabulum, quod olim (ut remur) Carura dicebatur situm est. Paharuëtus, in quo sunt portae, quas supra demonstraui, ab austro, Caucasio obijcitur, Caucasij tergum. Paharopanisus tuetur, ab Aquilone. Dextrum, latus, ab ortu, Imaus tegit, a sinistro, Paharuëti quaedam flexio, quae deinde, aequali fere ductu, cum Paharopanis, interiectis magnis conuallibus, in Aquilonem protenditur. Nostra aetate, montana haec omnia, a Chabulo, in eo tractu nomen habent; ac Chabuli iuga dicuntur quae a ueteribus, promiscue, Paharopanisus dicebantur Ac ne montium nominibus, quispiam hallucinetur, duo ut sibi persuadeat, necesse est. Alterum, eadem continuatione, uarios flexus montes habere; et pro eorum uarietate uaria nomina sortiri. Nam (liceat enim exemplis, rem illustrare) a Geographis Imaus, cum jam Caspius est: et Caucasius, cum jam Paharopanisus est, et uice uersa nominantur. Alterum, nostro saeculo, longe alijs nominibus loca haec appellari quam ueterum memoria uerum adhibita, non mediocri, diligentia, uera loca, uel saltem quae ueris proxime accedunt, nos deprehendisse: vel eo, coeteris certiores, quod ea oculis conspeximus.

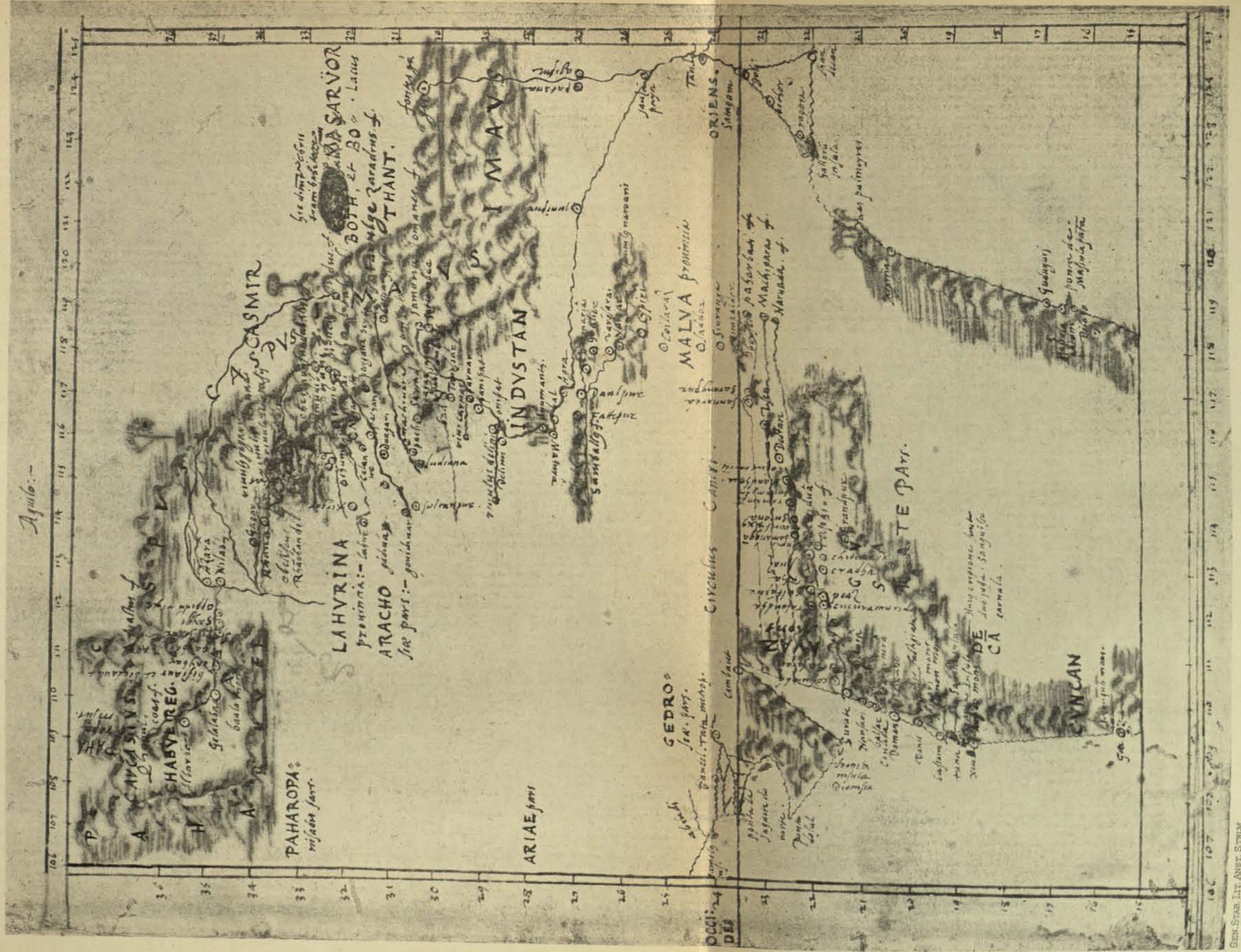
Thus he knows that merchants from India, Persia and Tartary arrive in Kabul, which, with a very good comparison, is said to be situated, as it were, in the very

¹ Vocitatur uero Indus, ab ignara plebe, ut plurimum, in ea regione, Nilabhus, quod caeruleam aquam, Persicè sonat *etc.* F. 69 a. 3.

² Professor K. V. ZETTERSTÉEN of Uppsala tells me that in Sanskrit nīla is the ordinary adjective for blue or dark blue, and suggests that the Persian nīl, blue colour, and nīli, are simply adopted from India.

³ Vide Vol. I, p. 30.

⁴ Op. cit., F. 85 b. 1 *et seq.*



intestines of these mountains, and from them, as from a heart, arms are stretched out in different directions in the surrounding regions, India, Sogdiana, Bactriana and Tartary. Then follows the wonderful passage about the mountain ranges, which, however, is not quite in accordance with reality, as Monserrate here no doubt has too much confidence in Ptolemy. In how far this is the case, we easily find by comparing the N. W. corner of his map with the map of Ptolemy, Pl. III, Vol. I. He enumerates the ranges: Caucasius Imaus, also called Caspus, Paharopanisus and Paharuëtus, in the middle of which is Caucasius, which may be said to be in accordance with his map. In front of Caucasius is Kabul. Paharuëtus, with its gates, is situated opposite to and south of Caucasius. The back or northern side of the latter is covered by the Paharopanisus, which also agrees with the map. Imaus is said to cover the right side of the Paharuëtus from the east, and on the left a certain ramification or bend of the Paharuëtus continues with a stretching nearly parallel to the Paharopanisus towards the north, separated from the latter by some extensive trough-shaped valleys.

In his time, the end of the 16th century, all the mountains in the region of Kabul, which were called Paharopanisus by the ancients, had their name from Kabul, and where thus called the Kabul Ranges. He advises everybody to make sure of two things to prevent being misled by the names of the mountains. The one thing is that the same range of mountains may form different windings, and for every such winding special names should be given. He explains his meaning by an example: The Caspius is called Imaus by the geographers, and the appellation, Caucasius, is used where the Paharopanisus system has already begun — and *vice versa*. The second point is that, as Monserrate had found, in his days the regions in question had for a long time possessed other names than in the days of the Ancients, and he had done his best to get reliable information and to use his own eyes.

Still, his geography is only given *en passant* as being necessary to illustrate his historical narrative. The bulk of his geography is intended for his Bk. II, as he says: »Est enim India, omnium Asiae prouinciarum, maxima, longe, lateque amplissima, cuius descriptionem sequenti libro, si Deus dederit, explicabimus.»¹ No loss could be greater for every student of the history of Asiatic exploration, than that of the second Book of Monserrate.

In giving the boundaries of Akbar's Empire, he says of the one to the north, the only one that interests us here: »Quod quidem latissime patet. Nam ad Aquilonem uersus Circium, monte Imao, qui etiam nunc, ab incolis Cumaumus dicitur, continetur. Indi amne, et Paharopanisio.»²

¹ F. 92 a. 2.

² F. 115 a. 5.

4. VII.

We now come to the passage in Monserrate's MS. which is the most interesting to us in this connection, *viz.* where he speaks of Lake Manasarovar.¹ He does it in connection with the information regarding Christian communities existing in Tibet. Though we have nothing to do with the religious side of the question, I quote the paragraph *in extenso*:

At uero, in interiori Imao, quo Agarenorum arma, non penetrarunt, si Joguijs, fides est tribuenda, qui multas regiones obeunt, sed multa commentitia, et a se conficta narrant, uerisque fabulas, intermiscent: reliquiae christianorum extant. Nam a Sacerdotibus, nonnulli, de Imai montis situ, interrogati dixerunt: montem esse arduum, et ascensu difficilem, in fastigio uero planum, et ad habitandum accomodatum, atque in ora cuiusdam stagni: quod ab incolis, Mansarūor dicitur: gentem quandam, peruetus quoddam oppidum incolere: qui octauo quoque die, in communem aedem sacrificij, et orationis caussa, conueniant. Hanc uero, esse sacrificij, et orationis religionem. Viros in dextera templi parte, a vestibulo ad phanum usque, et mulieres, in sinistra, more regionis, complicatis cruribus accumbere. In editiore loco, et medio, capiteque templi, hominem lintea ueste indutum, eodem more sedere; a fronte cuius humilis mensa collocatur, in quam, duo uasa aurea inferuntur, in altero quorum, uinum, in altero, panis asseruantur illum uero, di scripto, quaedam recitare, quibus caeteri respondent, tum pro concione, uerba facere, ad extremum, singulos, mares primum, deinde faeminas, sine strepitu, ordine surgere: ad Antistitem adire, ab eo modici panis frustum, deinde uini haustum, accipere, et iterum sedere, his peractis, domum suam quemque redire. Fuerant sane Sacerdotes, rem totam, diligenter exploraturi; nisi eorum consilij, legationis exitus obtitisset.

The beginning of this passage would therefore run as follows: »On the other hand, if we may believe the Jogis², who use to wander about in many regions, but who tell many fictions and inventions of their own and mix idle talk and truth together, remnants of Christians indeed exist in the interior of Imaus (Himalaya), where the arms of the Agarenians³ did not penetrate. For some people who had been asked by the priests (or Jesuit Fathers) regarding the situation of the Imaus (Himalaya) Mountains, answered: the mountain was high and steep and difficult to ascend, but still forming a plain in its higher regions and suited for habitation, and that on the shore of a certain pool, which is called Mansarūor by the natives, a certain people was dwelling in a certain very old city.»

Then he describes the rites as having a great resemblance with those of the Christians, and which, in later years, astonished so many Catholic missionaries in

¹ Op. cit., F. 116 b. 1 *et seq.* In *Geografiska Annaler*, Vol. I. Stockholm, 1919, p. 280 *et seq.* Dr. J. CHARPENTIER of Uppsala has directed my attention to this passage.

² »Later change: lacus; but, erased.» (Hosten.)

³ »Hind. jogi. A Hindu ascetic; and sometimes a conjuror! From Sanskrit yogin, one who practises the yoga, a system of meditation combined with austerities, which is supposed to induce miraculous power over elementary matter...» Yule-Burnell: *Hobson-Jobson*. London 1886.

⁴ Mohammedana, descendants of Hagar. More especially here the Tartarians of Timur. Monserrate says that Timur 187 years before had not left any traces of Christian religion in the regions he had conquered, but the Jogis assured that such traces were left in the inaccessible parts of the Himalaya.

Tibet.¹ At the end of the quoted passage, Monserrate tells us that certain priests indeed would have conducted a thorough examination of the whole matter, if the conclusion of the legation had not hindered their designs. From this it is obvious that no other Jesuits, in 1591, had been at Manasarovar. If such had been the case he would not have expressed the desideratum of examining the mystery of the Christian community. He has, as Tieffenthaler 200 years later, obtained most of his information from natives. Probably the Jesuit missionaries had met some Hindu pilgrims who had been at the Sacred Lake.

Which is this very old town on the shore of the Manasarovar? The inscription about the Christians on Monserrate's map indicates the northern shore, but it is more likely that the Jogis meant the southern, where the surroundings of Tugu-gompa are visited every year by pilgrims from India. This had been the case, not only during the last 340 years, but also many centuries before Monserrate's time, even if the present building of Tugu-gompa may date from a later epoch.

In his Appendix B.² »Texts from Monserrate's lost Bk. II quoted by Col. F. Wilford«, Rev. Hosten proves that the MS. in Wilford's possession was different from the Calcutta MS. and contained several details about the Sacred Lake not mentioned in the latter. We do not need to enter upon them here, as I have quoted Wilford already in Vol. I, p. 154. Only three of Wilford's paragraphs, rather unimportant by themselves, are still of a certain interest in connection with the short notes which Rev. Hosten had added to them. Wilford says: »The first European who saw it (Lake Manasarovar), was P. Andrade in the year 1624.« To this passage Hosten has the following note: »This is not at all proved. Rather the contrary. Cf. on the lake seen by Fr. Antonio de Andrade, S. J., C. WESSELS, S. J., ANTONIO DE ANDRADE reprinted from *De Studien*, Nijmegen, L. C. G. Malmberg, Jaargang XX (1912), LXXVII, Afl. No. 4, p. 22.«³

In the place pointed out by Hosten, Wessels quotes the information he has obtained from Dr. HENR. HAACK of Gotha and Colonel S. G. BURRARD of India regarding the pool Deo Tal on the Mana Pass, the »grande tanque« of Andrade, and he concludes⁴ that »Andrade's discovery of the Lake Manasarovar, must, therefore, definitely be stricken out, though the importance of his journey cannot therefore be diminished, for this depends on the fact that he was the first European who, straight across the Himalayan Mountains, and along the principal feeder of the Ganges, reached Tibet.«⁵

¹ I have dealt with the matter at some length in a chapter called »Lamaism and Catholicism«, *Transhimalaya*, Vol. III, p. 310, 330. Cf. G. Schulemann: *Die Geschichte der Dalailamas*. Heidelberg 1911, p. 75 et seq.

² Op. cit., p. 693.

³ Vide Vol. I, *supra* p. 163, noten.

⁴ *Ibidem* p. 23.

⁵ Vide Vol. I, *supra* p. 166 et seq.

European Geographers, even not very long ago, believed that Andrade had discovered the Sacred Lake, though the Jesuit Father himself never said a word about the Manasarovar. I have proved in Vol. I that the origin of this mistake is to be found in KIRCHER'S *China . . . illustrata* (Amsterdam 1667), and especially in the following passage¹, where he, involuntarily, confounds Andrade's »tanque» with information he had obtained elsewhere about the lake Manasarovar: *Iter verò quod P. Antonius Andrada Lusitanus in Regnum Thebet aggressus fuit, tale est: Ex Lahor Gangem trajiciens primò in Scrinegar & Ciapharangam urbes ingentes populosissimasque, ex hisce per altissimum montem transgressus in summitate ejus ingentem lacum, commune Indi, Gangis caeterorumque Indiae majorum fluminum hydrophylacium detectum observavit.*

The second paragraph of Wilford is this: »and in the years 1715 and 1716, it (Manasarovar) was visited by the missionaries P. Desiderius, and Emanuel Freyer (Freyre).» To which Rev. Hosten has the note: »It appears from Carlo Puini's *Il Tibet . . . secondo la relazione del P. Ippolito Desideri* (1715—1721), Roma 1904, that Desideri did not pass near Lake Manasarovar. He does not mention it.»

Here, however, Wilford is perfectly right. Desideri is the first European, of whom we know, who has visited Manasarovar. It is true that he does not mention this name, for he calls his lake Retoâ. But his description does not leave any room for doubt. These are his own words:

Further on we passed a plain called Retoâ, where there is a great lake which has a circumference of some days walking, and from which the Ganges is supposed to originate. However, as a consequence of what I could observe on my way and which I heard experts of the places as well as of the Mogol to agree on, it seems to me that the above mentioned mount of Ngari Giongar (Kailas) should be recognized as the true origin and source of the Ganges, as well as of the river Indus. That mount being the highest from which the land slopes on both sides, the one as well as the other, the waters, either from rain or from melting snow, which descend from there on the western side, flow into the second Tibet, as practically shown by facts; and after having gone through it, cross the Little Tibet In the same way the waters descending from Ngari Giongar on the eastern side flow first into the said lake Retoâ, then, following their way down, they form the river Ganges Moreover, that lake is the object of a great veneration by those superstitious people; therefore, they meet sometimes there in a pilgrimage, and make the tour all round the lake with great devotion believing to acquire many indulgences, and in some way to win many particular jubilees.²

There is no other lake in Tibet of which such a definition could be given, except Manasarovar, and other arguments are superfluous. With his admirable perspicacity Desideri has not contented himself with the information he got from the natives; he has also used his own eyes: »Permi però, da quel che ho nel passaggio

¹ P. 64b.

² Vide Vol. I, p. 274, 275.

osservato . . . » The merit Monserrate has acquired, so far as the Manasarovar is concerned, is no doubt very great, and he is, as far as we know, the first European who ever wrote down the name of the lake. But, judging from his own words: *Nam a Sacerdotibus, nonnulli, de Imai montis situ, interrogati dixerunt . . .* he had not made the questions regarding the lake, himself, but had obtained his information from other missionaries, which seems to prove that the name Manasarovar was known by other missionaries and certainly taken down before Monserrate had heard of it.¹ This is of consequence only as it suggests the question: where are the original annotations of those missionaries, and have they possessed other information not to be found in Monserrate's MS.? It should also be remembered that Desideri's merits in connection with the lake are much greater than those of Monserrate, as the former visited the lake personally, while the latter only wrote down what he had heard from other missionaries who had questioned the Jogis.

In a third passage Wilford says: »but what is more surprising, the good father was ignorant that the Ganges issued from it (the Manasarovar).» To this Rev. Hosten adds in a note: »Wilford is himself making a mistake here, unless he means the Brahmaputra, the source of which is not yet satisfactorily known.» Now, fortunately, the source of the Brahmaputra is very well known, and it is known that the river has not the slightest communication with the lake. To reach parts of the river not yet satisfactorily known, we have to proceed farther east, where a few such sections of the Tsangpo still exist. Wilford believed as firmly as Major RENNELL and all other geographers of the time, in the hydrography of the Lama topographers and D'ANVILLE, namely that the Ganges really originated from the Sacred Lake. It is highly to the credit of Antonio de Monserrate that he, some 135 years before those topographers, penetrated the mystery with the same intelligence and perspicacity as Desideri, though he had no occasion to visit the lake personally.

Rev. Hosten has devoted Appendix C. to Monserrate's map of India, which he has reproduced at about double the size of the original. He, fortunately, helps us with the very difficult and diminutive writing, which even for him was no easy task. I cannot enter upon his most able and thorough examination, which certainly hardly could have been better done.

It is obvious that the original map of Monserrate has lost in clearness by the reproduction. This is of course, still more the case with my reproduction, Pl. I., of Hosten's reproduction. However, I have had it made to give at least a faint idea of its *appearance*, the general disposition of the mountains, the situation of Lake Manasarovar and some of the names. I have it in exactly the same size as Rev. Hosten.

¹ MONSERRATE embarked for India in 1574 together with 39 missionaries headed by Fr. ALEXANDER VALIGNANL. Hosten, *Op. cit.*, p. 515.

In the N. W. corner of the map, the mountains have been arranged in the form of a square, including Chabul Reg., this being the single orographical feature on his map where Monserrate has not been able to make himself independent of Ptolemy. To the north we find Paharopanivus, which seems to start northwards at right angles to the latitudinal Caucasus. In the west and south, and partly east, is Paharhvaetus. To the N. E. the square is partly bounded by the Caspvs, which, as one single range, continues to the east and S. E., where the name, S. W. of Casmir, is written once more, and where the mountain system becomes broader and more complicated.

The Caspvs immediately and farther S. E., goes over into the Imavs, which, N. E. of Agra, makes a very sharp bend to the east, where the name is entered a second time. The Caucasus, being situated north of Qhabul, corresponds to Hindu-kush. The Paharopanivus, situated north of Hindu-kush, should be the western parts of the Pamirs. The Paharhvaetus corresponds to the mountains west, south and S. E. of Kabul, amongst others the Suleiman System. As the western Caspvs has been placed north of the sharp bend of the Indus, it ought to represent the Karakorum, though the general situation shows us that he means parts of N. W. Himalaya.

His Imavs is, of course, Himalaya, and the most interesting feature of his representation of this system is, that he has drawn it, not as *one* single range, but as five or six parallel ranges, which is indeed very surprising, as cartographers hundreds of years later sketched only *one* range. A glorious exception to this rule is JACOPO GASTALDI'S map of 1561, which is, however, of a quite different type from Monserrate's, for Gastaldi has, in the N. W., eight or nine ranges, and between the sources of the Ganges and Diserto de Camvl, two ranges. In 1730 STRAHLENBERG in these same regions had only one Mus Tagk alias Imaus Mons (Vol. I, Pl. XLIX). B. H. HODGSON on his maps of 1849 and 1857 had one mighty and one rather small range, with transverse ranges issuing from the first (Vol. III, Pl. XV, and Pl. II, here.) Disregarding the natural misrepresentation in detail, Monserrate was far before his time, when he sketched the Himalaya as a very broad system, not as a single range. As I have shown in Vol. III the Transhimalaya has had to go through the same stages of development, though it belongs to a much later epoch.¹

The name Tibet is missing, but, written in pencil by the anonymous commentator: Both et Bothant, both names placed south of Manasarovar and north of Himalaya. This seems to indicate that the commentator and probably Monserrate

¹ At the little village of Moolipoor, one stage from Sirhind, Major LLOYD expressed his admiration of Himalaya, which Monserrate may have seen from here: »It was from here that we first saw the fretted crest of the Himalaya, but so distant, that it seemed more like a distinct reflection of mighty mountains of snow upon the deep blue ocean of the sky than anything real.« *Narrative of a journey from Caunpoor* etc. Vol. I. London 1840, p. 73.

had no knowledge of the great extent of Tibet, though, of course, »Indvstan» also covers only a very small part of Akbar's India.

Of the greatest interest is perhaps the way in which Monserrate has drawn the relations between the Sacred Lake and the sources of the four great rivers; a problem which has been discussed and disputed for centuries afterwards. Though he very much exaggerates the size of the lake making it 170 km. instead of 22 from west to east, and 85 km. instead of 27 from north to south, he does not believe it capable of giving birth to a single river. He calls it *Māsarvōr Lacus*, and has, just north of it, written in red ink: *Hic dicuntur christiani habitare* — in accordance with the rumours he had heard about the temples on the shores.

The source of the Indus f. is placed in the higher regions of Imavs west of the lake. S. W. of the lake the *Satanulge* (Satlēj), *Zaradrus* f., has its origin. S. E. of the lake, and at greater distance, is the source of the Ganges, *Fontes gāgis*. There is no sign of a *Tsangpo-Brahmaputra*. Rev. Hosten says:¹ »To the right of the lake appears twice the letter f., which should mean: *fluvius*. These two rivers are neither the *Satlēj*, nor the *Indus*, nor the *Ganges*, according to Monserrate. They are nowhere mentioned in the text. I thought I could read near the lower f. the name *Adris* (=the *Raoy* or *Ravi*, otherwise not named in the map); but, this supposition is negatived by the longitude $116^{\circ} 7\frac{1}{2}'$, assigned to the source of the *Raoy*: hence, I propose to read (*Mansar*) *auris* f. It is impossible to guess what the other river might be.»

I do not pretend to approach the solution of this question any nearer than Rev. Hosten, but I cannot accept his second reading. Monserrate calls the lake *Mansarvōr*, both on the map and in the text, not *Mansaraur*; and it is quite impossible that he could call the great lake a *fluvius*, especially as he has *Māsarvōr Lacus* on the map.

It could, perhaps, be possible to think that a *Mansarauris fluvius* were meant as a river entering the lake or issuing from it, and thus simply called the River of *Manasarovar*, which could perhaps be the *Brahmaputra*. But this is not at all likely. The first reading, *Adris*, or *adris* as it is on the map, must be the right one. Now, this *adris* seems, so far as one may judge from the reproduction of the map, to be the latter half of a name, the first half of which has been covered by the colour or ink representing the lake itself. If the first part of the name has been *Zar*, we get the name *Zaradrus* f. or the River *Satlēj*, where an *i* has been miswritten instead of a *u*. If this interpretation is correct, one has to imagine that Monserrate has first heard that the *Satlēj* came from the lake, but that he, in consequence of some later information which seemed to be more likely, rejected the first representation,

¹ P. 703.

letting the lake cover the first half of the name and the letters *MA* the latter half — though not completely. The name, Satanulge Zaradrus f., is indeed written by a much stronger hand than the... adris f., as if the intention were to point out: *here* is the real source of the Satlej!

To which river the upper *f.* on the map may have belonged is, as Hosten says, impossible to guess. It is not at all likely that Monserrate has heard of the two rivers entering the lake from the east, the Samo-tsangpo and the Tage-tsangpo, though even the upper *f.* seems to have had a name in front. The Tsangpo-Brahmaputra is, as pointed out above, missing altogether. Whatever may have been the case, so much seems to be clear, that Monserrate was as uncertain regarding the hydrographical problem as so many geographers after his time. Compared with the hydrographical situation of 1908, his map is, at any rate, perfectly correct. I had also good reason to put a? before 1590 in the table of outflow from Manasarovar in Vol. II, p. 183. From Monserrate's map it seems very probable that none of the lakes had an outlet in 1582 or whatever year the Father may have drawn his map. But on the other hand, the verbal information he and other missionaries had obtained from natives, cannot be relied upon in drawing conclusions of scientific value. The map itself, perhaps with later additions, changes or improvements, and with the names of two rivers at the east side of the lake defaced, indicates a great uncertainty regarding the hydrography. The problem has been simplified by the draftsman in so far, that there is no Rakas-tal between the Manasarovar and what he calls the source of the Satlej.

Monserrate's map is wonderful in many other respects. Disregarding the complicated question of the relation between the Sacred Lake and the Indus and Satlej, he has correctly placed the sources of these two rivers quite near to one another. He knows that the source of the Indus must be situated somewhere in the neighbourhood of the Manasarovar, though he has placed it west instead of north-north-east of the lake. He knows that the Manasarovar is situated in the mountains S. E. of Casmir, though the latter name has been placed too near the source of the Indus.¹ He is quite familiar with the fact that the Upper Indus flows to the N. W. before it pierces the mountains and enters the plains. He does not seem to know Ladak, the country that was usually called Tibet, Baltistan or Little Tibet by other missionaries. Still a part of the N. W. flowing course of the Indus, belongs to Baltistan, and as this country is situated at the S. W. front of the Great

¹ Monserrate gives the following Long. and Lat.

Both et Bothant: 119—32;

Mansariior: 121—32;

Casmir: 118—33;

Chabul: 109—35½

and refers the reader to his map.

Kara-korum, the part of Monserrate's Caspus that is situated on the right bank of the Upper Indus may be said to represent the Kara-korum. In spite of this fact, and as his western Caspus is placed between Kashmir and Kabul, he, however, rather means the N. W. stretching of the Himalaya, and even the Hindu-kush, for it is not likely that he could have had any information about the Kara-korum. At any rate, and as Rev. Hosten has brought his most important MS. and his beautiful map to the knowledge of the geographical world, his name should not be missing in the history of exploration in the Kara-korum.

In connection with exploration around the Manasarovar, he also occupies an important place, though not as prominent as IPPOLITO DESIDERI. It may be regarded as pretty certain that the lost Book II of Monserrate contains a large amount of geographical information. There would certainly be found, amongst many other geographical things, what he has heard of Tibet. Comparing his text with his map, he seems to know more about Tibet than about Ladak, though the names Both et Bothant are entered on the map by the anonymous commentator.

It, therefore, only remains to express a hearty wish that Rev. Hosten may be successful in his energetic attempts to find the lost geography of the brilliant pioneer, Antonio de Monserrate.

CHAPTER IV.

BENEDICT GOËS.

It is surprising that such a critical man as ANTONIO DE MONSERRATE, who penetrated so many geographical questions in a quite modern style, and even was the first to catch the name of the Sacred Lake, did not use the native names for the Himalayan Mountains, but preferred to stick to the classical appellations which had been in use ever since the mountains north of India first became known to Europeans, or nearly two thousand years, and which had been crystallised by PTOLEMY. Thus the same names, Paropamisus, Caucasus and Imaus, which are to be found, for instance, on the World-map published at Venice in 1554, also appear on Monserrate's map. He seems not to have been willing to follow the example given by JACOPO GASTALDI in 1561, who on his famous map had entered the names Monte Dalangver, Monte Naugracot and Monte Vssonte. He knew at least the second of these three names, which he mentions at some places in his MS., *e. g.*: Duodeuiginti milliaribus, Nagarcottum a Calanuro distat, quod perinde est, quod Nagāris arx, vel castellum....¹ He preferred to call the mountains above Nagarkot, Imaus, instead of giving them the appellation Mons Naugracot.²

It would be interesting to follow through 23 centuries, the history of the names of the Himalaya. This would be quite a big task, and as it does not fall within the boundaries of this work, I will only mention two or three stages of the nomenclature. We have already passed one of them, *viz.*, Gastaldi, who abolished the classical names, and adopted native appellations.

An attempt to arrange in systematic order the names by different authors given to different parts of the great latitudinal mountain range or system which since times immemorial was supposed to cross the whole of the Asiatic Continent, was already made in 1596 by ABRAHAM ORTELIUS.³ In his *Thesaurus* one has to look up every special name. Under the name Paropamisus, for instance, he

¹ Op. supra cit. F. 60 b. 2.

² Nagarkōt or Kangra in the lower Himalayan hills.

³ *Abraham Ortelii Antwerpiani Thesaurus geographicus*. Antverpiæ MDXCVI.

enumerates the different classical authors who have used this name, and he gives the different spellings in which it appears. He also tries, as far as possible, to explain the chief orographical feature of each system, and the part it plays as a water-parting or source of great rivers. So he says:

Ex hoc Paropamisio, Indus fluvius fontes ducit, ut Plinius cum Arriano perhibet. quo tractu hodie à Pineto & Ger. Mercatore Pamer vocatur. Atque haec est altissima pars Orbis terrae M. Paulo Veneto teste. Naugracot in Asiae tabulis idem locus nominatur. In Paropamisio monte Arca Noë constitit, opinione Becani, lege eius Indoscythica. —

On Mercator's Map of the World, 1569, MARCO POLO is indeed mentioned as a witness of the legend: Pamer altissima pars totius continentis.

Under the name Tavrvs, Ortelius again collects all the different versions of appellations he has been able to find out. The Caucasus he places thus: Cavcasii montes, qui propriè sic dicuntur, sunt Ptolemaeo circa Oxi & Indi fluminis fontes. As to the Imaus, he tries to place some recent names belonging to that system, amongst others M. Dalangver and M. Naugracot.

Imaus, Straboni pars Tauri Montis, ad Mare Eoum, contestantibus Plinio & Orosio. Emaon, ἑμαον, Arriano dicitur, in Indicis: sed idem paulò infra habet quoque ἱμαξον. Semanthini Montes Ptolemaeo sunt. Ger. Mercator Inifa interpretatur cuius Paulus Venetus meminit, argentique fodinas in eo esse scribit. Jac. Castaldus Altai putat, ubi omnes Tartariae Imp. sepeliuntur. Bapt. Ramusius hunc Altai eundem esse putat cum Belgian monte, in quo Haythonus Tartaros habitasse ait. Hic Imaus mons, videtur Postello Sephar, cuius in Sacris litteris memoria est. Imaus Ptolemaei ab hoc Imao longè alius, nempe qui ex radicibus Tauri exoriens, & vsque ad Mare Glaciale progrediens, Scythiam (quae ab eo Intra & Extra Imaum cognominatur) bifariam diuidit, hunc ab accolis Dalanguer & Naugracot appellari tradit Castaldus. Huius Imai promontorio (si in remotissimis mihi quoque diuinare lubeat) videntur Altai & Belgian recentia nomina quadrare. Imavm Montem aestimat Montanus in suo Apparatu Biblico Abimael Hebraeis nuncupari. Theuetus Imaum Copizath ab Indis nominari dicit.

In the first 50 or 60 years after Ortelius, both classical and recent names appeared on the maps. SANSON D'ABBEVILLE, 1654, has Mont de Caucase and Dalanguer Mont. KIRCHER, 1667, has Caucasus mons, Montes Tebetici and Belor Mons. On VISSCHER'S map of 1680 we find Naugracut together with Kircher's Montes Tebetici and a new appellation: Serenager Montes. On DELISLE'S map of 1705, Naugracut seems to begin to be antiquated, and Himalaya is now called M. de Purbet ou de Naugracut. A year later Delisle introduces the name M. Hendoukech on his maps. In 1723 the same draftsman has Mont Ima Montagne de Negracut for Himalaya and Mont Tangri ou Tangour (Langur?) for its eastern part. He also knows Mont Tanla ou Otunlao. STRAHLENBERG, 1730, has M. Hendukesh and Mus Tagk alias Imaus Mons, though he is not the first to introduce these names. On D'ANVILLE'S map of 1733 we read in the Himalaya region, so far as it is embraced by the map, such names as Rimola MM. Tchomla MM. Oumoula MM., which have a certain resemblance to »Himala». On RENNELL'S map

of 1788, we find Gomaun Mountains, Sewalick Mountains, and »Mountains covered with Snow and Ice». A. ARROWSMITH in 1801 has Himlah Mountains covered with Snow, and in 1804 Himmaleh Mountains which, in 1812, on MOORCROFT'S map, is changed into Himáchal Mountains. ALEX. GERARD in 1821 has the correct spelling: »Chain of the Hither Himalaya covered with perpetual snow», while FR. HAMILTON two years before had written »Himadra or Himaliya Mountains the Emodus of the Ancients». LAPIE, 1824, writes Himalaya, HUMBOLDT, 1831, Himálaya, and BERGHAUS, 1835, Himalaya, a name that after this time has remained the only one used on the maps, though in 1840, Major Sir WILLIAM LLOYD also used the form Himala alternating with Himalaya.¹

In the preceding paragraph I have thus only mentioned a few of the names which in the course of many centuries have been given by Europeans to the Himalayan Mountains. Though this name, Himalaya,² was famous already in the epic songs of Ancient India, and nowadays is known by nearly every child in civilised countries, the missionaries who penetrated into Tibet, crossing the whole system of mountains, do not seem to have heard, at any rate do not mention it.

In the first quarter of the 17th century, several missionaries had crossed the Himalaya into Tibet and Ladak, and one of them, GOËS, even the whole world of mountains separating India from Eastern Turkestan, though he travelled far to the west of Tibet. For the geographers of their time it was impossible to draw out any reasonable orography from their narratives. And if the Himalaya to these travellers themselves remained an enigmatical and puzzling orographical formation, one could not expect that others, who had never been in Asia, should be able to construct the great orographical features from such insufficient material. As the conception regarding the Himalaya, which the travellers had seen with their own eyes, was so unclear, they could, of course, not bring home any kind of information regarding the system farther north, the Kara-korum and Kwen-lun. It took another hundred years until DELISLE, 1723, represented Grand Tibet as a rather extended country between two mountain ranges. Still, if we compare Pl. XLIII and Pl. XLIV of Vol. I with one another, we find, though both are practically the same map from 1726, the range that separates Bucharía Minor from India on the former called Imaus Mons and on the latter, Mus Tag. On the map accompanying the Journal of LANGE, 1727, the same range north of the Indus is called Imaus Mons Mus Tag. The same is the case with STRAHLENBERG'S map where there is only one great range between Magni Mogolis Imperii Pars and Mugollia, or between Caschemir and Regnum Chotena, this range being called Mus Tagk alias Imaus Mons. As I have tried to show in

¹ *Narrative of a journey, etc.* Vol. I. London 1840, *passim*.

² About the different forms, Himála, Himákala, Himádri, Himagiri, Haimavata, Himavan, *etc.*, *cf.* LASSEN: *Indische Alterthumskunde*, I, Leipzig MDCCCLXVII, p. 21.

Vol. I, this mistake is very easy to explain. From the Indian side only the Imaus Mons was known. From the Central Asiatic side the mountains visible to the south and simply called Mus Tag or Ice Mountains by the natives, were supposed to be the northern side of the Imaus. For the country between the two was unknown, and the narratives of Andrade and other missionaries also remained — either unknown to the cartographers, or misunderstood, or regarded as unreliable.

As an illustration to this general discussion, a few words may now be said of the two great pioneers, BENEDICT GOËS and ANTONIO DE ANDRADE, who have been dealt with before.¹

Between them a third pioneer, DIEGO D'ALMEIDA, will be introduced.²

After my first volume was already printed, the new edition of Sir HENRY YULE'S *Cathay and the Way thither* was published, in 1916, »revised throughout in the light of recent discoveries» by HENRI CORDIER, and it contains much important material regarding Benedict Goës that should not be missing in this historical account.³ In Vol. I we had to deal with him from a more general point of view. Here we have to consider only the part of his journey during which he approached the vicinity of the Kara-korum Mountains. In the same way we will have to return to nearly all the travellers and geographers who have already been considered in the first three volumes of this work.

To begin with, Yule states that the part of Goës' journey which lies between Kabul and Yarkand is the least known. Several names mentioned by him cannot be identified, and we cannot tell with certainty where he has crossed the Hindu-kush. »This is also the case in the second portion of this section of the journey, embracing the ascent through Badakhshan to the Plateau of Pamir, and the descent to Yarkand, where, moreover, we are in a country still most imperfectly known; for since Marco Polo, Goës is the only European traveller across it of whose journey any narrative has seen the light.»⁴

Yule believes that Goës crossed by the Pass of Parwan, as Parwan and Charekar are mentioned in his narrative. The pass of Parwan was unsuccessfully attempted by Wood in 1837.

As to the road from Talikhan to Pamir, we find only the descriptive name of Tangi-i-Badakhshan, and Yule believes the road is the same as the one taken by Wood on his journey to the source of the Oxus.

¹ Vol. I, p. 158 *et seq.*

² Dr. J. CHARPENTIER of Uppsala has kindly directed my attention to this interesting traveller. *Vide Geografiska Annaler*, Stockholm, 1919, p. 269 *et seq.*

³ *The Journey of Benedict Goës from Agra to Cathay. — Cathay and the Way thither*, Vol. IV, London MDCCCXVI, p. 169 *et seq.*

⁴ *Op. cit.*, p. 181. Cordier here refers the reader to *Marco Polo*, third edition, for information regarding recent travellers.

Yule notes only the Chinese pilgrims, MARCO POLO and GOËS as having travelled by routes across the Bolor Tagh and the high table-land of Pamir between Badakhshan and Kashgar. He thinks Marco Polo followed a course running north from the head of the Oxus valley over the plateau to the latitude of Tashbáliq, before descending into eastern Turkestan. The same way was obviously taken by the Chinese pilgrims. Goës, according to Yule, probably crossed athwart the Pamir in the direction of the sources of the Yarkand River, »and passing two or more of the ridges that buttress the Bolor on the east, to have descended on Yanghi-Hissar . . .»

It should be remembered that this was written in 1866, when Yule believed that Eastern Turkestan or »Little Bokhara» was shut in on the west by »the transverse chain of the Bolor, dividing it from Western Turkestan».

The part of Goës' journey that interests us most, begins from Ciarakár, which Yule identifies with IBN BATUTA'S Charkh, and Cordier with Chārkār, in Afghanistan, at the mouth of the Ghorband valley, about forty miles north of Kabul. Then the description runs: »Ten days later they got to a little town called Paruán, and this was the last in the Mogul's territories. After five days' repose they proceeded to cross over very lofty mountains by a journey of twenty days, to the district called Aingharán, and after fifteen days more they reached Calcia.»

WOOD also mentions the village I-Angheran, which, however, is south of the mountains, whilst the village of Goës is on the north. Yule suggests that it may be Ahan-gharán or the »Iron mines». As to Calcia, Yule mentions a people of Persian race called Ghalchas who dwell in the hill country east of Bokhara, and of which VALIKHANOFF says: »The Tajiks have dark complexions and hair, whilst fair people are found among the Ghalcha.» The latter statement agrees with the text of TRIGAULT: »There is a people here with yellow hair and beard like the people of the Low Countries, who occupy sundry hamlets about the country.» Then it runs: »After ten days more they came to a certain place called Gialalabath. Here are brahmans who exact a toll under a grant made to them by the King of Bruarata (Bokhara). In fifteen days more they came to Talhan, where they halted for a month, deterred by the civil wars that were going on; for the roads were said to be unsafe on account of the rebellion of the people of Calcia.»

Yule regards Talhan as the first *terra firma* of the narrative since quitting Parwan, and identifies it with Talikhan, about 50 miles east of Kunduz. It is the same as Marco Polo's Taican, and Cordier adds that Goës now enters the route of the Venetian, and believes that he is now marching in his footsteps »until he reaches the Pass of Chichchiklik, viz. the River Vardoj, the Pass of Ishkashm, the Panja, to Wakhán; Little Pamir at Bozai-Gumbaz joins with the Pamir-i-Wakhán at the Wakhijrui Pass, first explored by Colonel LOCKHART'S Mission. Hence the route lies by

the old fort of Kurgan-i-Ujadbai at the junction of the two branches of the Tāgh-dum-bāsh Pamir, the Tāgh-dum Pamir and Tāsh-Kurghān.»¹

Then the text says: »From this they went on to Chemān . . . », which Yule suggests may be Wood's I-Khanam, and Cordier Teskan or Teshkán on the road to Faizabad.

The journey from this place to Yarkand is described thus:²

After eight days of the worst possible road, they reached the Tenghi Badascian. Tenghi signifies a difficult road, and it is indeed fearfully narrow, giving passage to only one at a time, and running at a great height above the bed of a river They halted here ten days, and then in one day's march reached Ciarcunar, where they were detained five days in the open country by rain, From this in ten days they reached Serpanil, but this was a place utterly desolate and without a symptom of human occupation; and then they came to the ascent of the steep mountain called Sacrithma. None but the stoutest of the horses could face this mountain; the rest had to pass by a round-about but easier road. And so, after a journey of twenty days, they reached the province of Sarcil, where they found a number of hamlets near together. They halted there two days to rest the horses, and then in two days more reached the foot of the mountain called Ciecialith. It was covered deep with snow, and during the ascent many were frozen to death, and our brother himself barely escaped, for they were altogether six days in the snow here. At last they reached Tanghetār, a place belonging to the Kingdom of Cascar. Here Isaac the Armenian fell off the bank of a great river into the water, and lay as it were dead, for some eight hours till Benedict's exertions at last brought him to.

In fifteen days more they reached the town of Iakonich, and the roads were so bad that six of our brother's horses died of fatigue. After five days more our Benedict, going on by himself in advance of the caravan, reached the capital, which is called Hiarchan, and sent back horses to help on his party with necessaries for his comrades. And so they also arrived not long after safe at the capital, with bag and baggage, in November of the same year 1603.

On the excellent map accompanying Yule's *Cathay* Vol. IV, the route of Goës is marked in red, the most probable or certain route in a solid line, the alternative route in a dotted line. He travels from Kabul northward, crossing the Hindu-kush, traverses portions of Afghanistan and Badakhshan to the Ab-i-Panja (Tengi-Badascian), follows the river southwards along and through Roshan, Shighnan and Wakhan by Kala Panja and Dasht-i-Mirza Murad. Continuing thence eastwards, south of Hūanchuang's route, he crosses the Wakhjir Pass, and, below Beyik, turns north along the Taghdumbash River to Tash-kurghan. Along his route from Wakhjir to Tash-kurghan we find, to his left or north and west of his route, the names Serpanil, Sacrithma and Sarcil. From Tash-kurghan he is supposed to have crossed the Chichiklik Pass, and to have continued to Chihil-gumbaz. From here the solid line is drawn to Yangi Hissar (Tanghetar), whilst the alternative route is drawn by Yakarik (Iakonich) to Yarkand (Hiarchan).

¹ *Cp.* Vol. VIII.

² *Op. cit.*, p. 214.

In the western section of his route Benedict Goës has thus crossed the Hindu-kush, and farther east he has at least been in close contact with the Kara-korum System.

The Tangi-i-Badakhshan or Defiles of Badakhshan, an expression that also had been found in the Akbar-namah, Yule places along the Oxus in Darwaz and Shagnan. The Ciarciunar he certainly correctly identifies with »The four plane trees», in Persian. Serpanil he takes to be Sir-i-Pamir, »the head of Pamir», Sacrithma he thinks may be the Sarikbaee of MACARTNEY'S map. Yule believes it is the ridge which separates the Sirikul from the headwaters of the Yarkand River. Sarcil or Sarcol is Sarikol as Ritter suggested.

Yule first believed that Goës' Tanghetar was meant to be Yangi-hissar, but he abandoned this view after having found a Tungeetar in Macartney's map. Iakonich he could not trace.

In spite of the scanty notices given in Goës' notebook, M. A. STEIN states them to be quite sufficient for tracing his steps to Tash-kurghan. Stein identifies the hamlets of Sarcil or Sarikol with Tash-kurghan, and Iakonich with Yaka-arik,¹ as had already been done by Father J. BRUCKER who says of Iakonich: »nous croyons qu'il faut lire Yakarik, nom d'une localité un peu à l'ouest de Yarkand, à laquelle les officiers anglais attribuent 700 maisons».²

This statement Brucker has got from the abridged German translation of FORSYTH'S Report 1873 in *Petermann's Mitteilungen*, where the village is really called Jakarik, instead of Yakka-arik as in the original.³

Before the geography of the Pamir became known it was, of course, impossible to trace the route of Goës. ATHANASIUS KIRCHER has an abridged version of his narratives, in which some of the interesting names are missing, others spelt in a different way, and he makes no attempt to place them. There we read:

.... tandem Ciarciunor tenuit, & post decendium Sarpamil desertum locum, transeuntes per altissimum montem viginti dierum itinere in Sarcil provinsiam pervenit, post biduum ad pedem montis Cecialath, in quo ob nivium multitudinem multi frigoris vehementia periëre, pervenit, sex diebus in nive peractis in Tamgheran Regnum Cascar, & post 15 dies Jaconich, & post dies quinque Hiarcham Cascaris metropolim & finem Cabulensis pervenit.⁴

In this passage we miss the mountain Sacrithma, whilst Tanghetar is called Tamgheran. Tanghetar is correct, as there is still a Tangi-tar in the valley. It, therefore, must be by a mere chance that there is a Tamghara as well, viz. in the valley of Keng-kol, and not far below Tangitar. When, June 28th and 29th 1894, I stayed at the aul of Keng-kol, I first heard the name of Tamghara, the river Keng-kol being formed by three sources: Kashka-su, Tamghara and Bura. On

¹ *Ancient Khotan*, Vol. I, Oxford 1907, p. 40 et seq.

² *Benoit de Goës missionnaire voyageur dans l'Asie Centrale 1603—1607*, Lyon 1879, p. 24.

³ *Pet. Mit. Ergänz. H. No. 52*. Gotha 1877, p. 72.

⁴ *China . . . illustrata*, Amstelodami 1667, p. 63.

HASSENSTEIN'S map of my journey the name is spelt Tom-kara. Tom-kara is probably the correct spelling, meaning »the Black Cabin».¹

In Astley's Collection where the text of Purchas is followed, no explanations have been added to the puzzling names.²

We have to proceed to RITTER, 1837, to get reliable, though still insufficient information. He says of Talhan: offenbar das heutige Talighan im Osten von Kunduz auf dem grossen Karawanenwege nach Badakhschan, zum obern Kokscha-Thale. Of Tengi Badascia he says: Tengi Badascia, worunter unstreitig an der Ostgrenze von Badakhschan der Gebirgspass verstanden werden muss, der zur steilen Gebirgshöhe hinaufführt. In Ciarcunar, Ritter recognizes the Kartschu of Klaproth, placed by him on his map (see below) on the Upper Yarkand River, though he finds it incomprehensible how the place could be reached in one day from Tengi. Serpanil, Ritter cannot identify, and asks whether it be Serek? Sacrithma he cannot make out. Sarcil, Ritter identifies with Serekul or Sirkul. Of Ciecialith, Ritter says: Es ist dies offenbar Tchet-chetlagh-Dawan auf Klaproth's Carte centr. im Norden von Sirkul ganz nahe gelegen, unter 38° N. Br., ein Bergpass, den die Route nach Yarkand wie nach Kaschgar übersteigen muss. As to Tanghetar, Ritter believes it is an inhabited place. Yaconich, he cannot explain.³

On his famous map of Central Asia published in 1836, quoted by Ritter, and reproduced in this volume, KLAPROTH has entered some of the names mentioned above, as Katchout or Kartchou, Serek, Sere koul and M. Tchitchak lagh dawan, the last two being Sarikol and Chicheklik-davan, the Sarcil and Ciecialith of Goës.

Considering the names of special interest to us, Yule is no doubt right in identifying Serpanil with Sir-i-Pamir, »the head or top of Pamir». The resemblance becomes still more in Goës' favour if we write Seripamir, for head in Persian is *ser* and not *sir*. It may be still more improved if we remember that the natives themselves always say Pamil and not Pamir. The name Goës has heard is, therefore, Seripamil.⁴

¹ *Vide* Vol. VIII. The name Tamgeran is entered on Strahlenberg's map, Pl. XLIX, Vol. I, obviously taken directly from Kircher.

² *A General Collection of Voyages etc.* Vol. IV. London MDCCXLVII, p. 643 *et seq.*

³ Pater Ben. Goës Route von Badakhschan (Badascia) über Kartchu (Ciarcunar) nach Sirkul (Serekul, Sarcil) und Tchetchet-lag-Dawan (Ciecialith) durch das südliche Gebiet Kaschghars in das Königreich Yarkand (im J. 1603 n. Chr. G.). — Ritter, *Erdkunde*, VII. Berlin 1837, p. 503 *et seq.* — Yule says: »Ritter first in recent times took some pains to trace the route of Goës systematically, by the light of modern knowledge regarding these regions, such as it is. It will be seen by the notes that I have on various occasions ventured to differ from him.» — *Cathay*, Vol. IV, p. 194.

⁴ Cp. also BRUCKER, *op. cit.*, p. 23, note 1; and *Pet. Mit.* 1872, p. 165, where A. FEDSHENKO says: »Den Eingeborenen ist dasselbe (Pamir) unter dem Namen Pamil bekannt. Sie unterscheiden Pamil-kalanj (das Grosse) und Pamil-hurd (das Kleine)....»

Sacrihma has been a puzzle to all geographers. Yule applies this name to the range »which separates the Sirikul from the headwaters of the Yarkand River.»¹ Probably it would be more correct to say that it belongs to the range west of the Taghdumbash-daria, the one called Sarikol Range by BURRARD. But it is more likely that only a high and difficult part of a mountain is meant and not a range, as Goës' sense for orographical features was probably not more developed than that of other early travellers. Orography was not a science in his time. At any rate, the name Sacrihma has no doubt a sound of genuine eastern Turkish. Goës sometimes seems to write *th* instead of *k*, or *c*. This is certainly the case with Ciecialith which ought to be Ciecialic. Sacrihma would therefore be Sacricma. Names ending with *ma* are to be found in Eastern Pamir, *e. g.* Tagharma, Köturma. Sacric has a certain resemblance with Sarik, yellow; as for instance, Sarik-kol, the broad yellow valley, but it still more resembles sekerik, as in Teke-sekerik, »The wild goat made a spring», which is the name of a place I passed on July 1st, 1894, near Pas-rabat in Eastern Pamir. In spite of all these resemblances, it is hard to get out any reasonable meaning of the word.

As to Sarcil, there is no doubt whatever that it must be Sarikol. The remaining names, Ciecialith, Tanghetàr, Iakonich and Hiarchan are as clear as anything. I have travelled this road, or at least the most important part of it, *viz.*, from Sarcil across Ciecialith and through Tanghetàr in 1894, and I have given a short description of it in my personal narrative.² There I say (p. 264): »Beyond that point (Yambulak) the glen was called Tenghi-tar, a very suitable name, although a pleonasm; for tar means narrow and tenghi narrow glen path.... Finally the glen contracted to a wedge-shaped trough, carved, as it were, out of the mountain-side. The path grew more and more difficult. We wound a hundred, a thousand times in and out around the fallen boulders; and every now and then crossed the stream, its water once more clear and limpid.... Above the hot springs the glen contracted still more, and at length became a veritable ravine, only a few yards wide, the air cold and clammy as in a cellar, the rocky sides perpendicular, the stream filling up nearly its entire width, dashing itself against the boulders, flashing up above them in spray, plunging down small waterfalls. One spot in particular I recollect quite well. It was a very ugly place. A number of big round stones, with brightly polished slippery surfaces, formed a kind of sill stretching obliquely across the bed of the torrent. A couple of men climbed up each on to a large boulder, and seizing hold of the packing-cases, and hauling away at them, helped the horses to clamber over.»³

¹ *Cathay*, Vol. IV, p. 216, note.

² *Through Asia*, Vol. I, London 1898, p. 258, Chap. XXII, »Through the Gorge of Tenghi-tar».

³ A more detailed description of this road is to be read in Vol. VIII.

A traveller who has made this road, and every moment expected to get a bath, will at once recognize the following words in the short narrative of Goës' journey: »Here Isaac the Armenian fell off the bank of a great river into the water, and lay as it were dead for some eight hours till Benedict's exertions at last brought him to.« Still he travelled through the Tenghi-tar in October, for he says he reached Yarkand in November, 1603 and had some 20 days to Yarkand from the difficult passage. I rode up the gorge on July 3rd, 1894, at a season when there was much water in the river. Finally I crossed the two passes, Kichik-kok-moynak and Katta-kok-moynak, being 4,593 and 4,738 m. high resp. »Between the two a small fanshaped valley gathered up a number of mountain-rills, and out of them formed an affluent to the Chichekli-su.... The name Chichekli is likewise given to the low saddle which serves as the watershed between the glen of Tar-bashi and the glen of Chichekli.«¹ Chichekli-kul is at a height of 4,458, and the passage of Chichekli-su at 4,420 m.²

September 28th, 1895, I rode through the extensive village of Yaka-arik which gets its irrigation water from a considerable canal, the Yaka-arik, »The isolated or outermost canal«, which gives its name to the village.³ As Yaka-arik is situated only 19 km. S. W. of Yarkand, it is surprising that Goës should need five days between the two places. Here the ground is perfectly even and the road excellent. Either he has stayed four days in Yaka-arik and travelled one, or it is simply a slip of his memory. Fifteen days from Tenghitar to Yaka-arik is also an exaggeration, but may be readily explained by slow and short marches on account of the partly very bad road.

Chicheklik, usually pronounced Chichekli by the Kirgiz, is a name alluding to the presence of a certain plant called chichek. Yaka-arik is, as a rule, pronounced Yakkarik, which comes somewhat nearer to Goës' Iakonich or Yakkonik. The two words of the name are contracted to one. The same may be the case with Sacrithma or Sakrikma.⁴

Benedict Goës' route from Chicheklik-davan to Yaka-arik no doubt followed a road which was well known and used by caravans in his days and centuries before

¹ *Through Asia*, I, p. 274.

² *Scientific Results*, Vol. V, Part I, a. p. 8.

³ In *Through Asia*, Vol. II, p. 718 it is called Yar-arik, which is a missprint. I have mentioned the place and especially the canal of »Jakka-arik« in »*Die Geographisch-wissenschaftlichen Ergebnisse meiner Reisen in Zentralasien 1894—1897*«. *Pet. Mit. Erg.* Bd. XXVIII, Gotha 1900, p. 4, 261, 262. In the Report of the Forsyth Mission Yakka Arik is said to be on »the limit of cultivation« which amounts to the same as my »Outermost canal«.

⁴ As the valley of Tenghitar is so well known, it is hard to see why, in the edition of *Cathay*, 1916, it should be placed at Yangi-hisar, on the map. If this were correct Goës should not have needed to lose six horses on the way to Yaka-arik. — In *Ruins of Desert Cathay*, Vol. I, p. 98 *et seq.* STEIN has also described this road across the Kashgar Range.

him. This road is mentioned in Forsyth's Report in connection with the limits of the Yarkand State: »Along the west frontier are the highland district of Sárig'h Kúl and the Kirghiz steppes of Pámir and Aláy; but these are beyond the present reckoning which only includes the country up to the foot of the hills, from Yakka Arik to Cháechiftlik or Chachiklik pass.»

Captain TROTTER of the FORSYTH Mission notes, from information given by KISHEN SING, the following road from Tash-kurghan to Yarkand: Tash-kurghan, Chehil Gumbaz, Tashkerim, from where a footpath leads across the hills to Kinkol camp, Khaizak-vil, the road continuing down Charling River, Arpalik, Kizil-tag'h — »Road good for three miles to Tangitar, where the river (Kizil) passes for five miles along a very narrow ravine, very difficult to traverse in the afternoon owing to floods caused by the melting of the snow on the hills above.» — Yak-arik (Yakka-arik), — »Good road over the 'Shaitan kum' or 'Devil's sand', and finally Yarkand.¹

This road, surveyed by Kishen Sing, seems in its beginning to be another than the one followed by Goës. At any rate it enters the latter somewhere above Tanghi-tar.

In the history of European maps of Central Asia, the itinerary of BENEDICT GOËS plays a certain, though not very important, part. It has not served to arrange the principal physico-geographical features on more solid lines than before. As a rule the old conception remains, and Goës' route is simply entered in the old frame and forced to agree with it. The cartographers of the 17th century obviously felt convinced that Goës' journey was of such great importance that they had to enter the names of his itinerary in one way or other. SANSON D'ABBEVILLE was quite at a loss about the general situation. On his map of 1654, Iarchan and Cascar are placed at the southern tributaries of a river running to the west, obviously the Sir-daria. To the S. W. of Iarchan he has Iaconich, Tanghetar and Ciecialith Mons. Between Usbec and Turchestan (Eastern) he has a meridional range, where the name, Sark, reminds us of Sarkol.

KIRCHER on his map in *China illustrata*,² marks the journey of Goës with a broad double line and the legend Iter Benedicti Goës in Cataium, along which the following names are entered: Lahor, Athec, Pallaur, Gideli, Cabul, Chiarakar, Parvan, Ancheran (mountains), Angheraz, Calcia, Silalabath, Talhari, Chaman, Giarcinur, Serpanil, Sortil, Gecialath mons, Tanhgera, Iaconich and Hiarchan, and finally the rest to the end of the journey.

¹ *Report of a Mission to Yarkand in 1873, under Command of Sir T. D. Forsyth* . . . Calcutta 1875, p. 35 and 434.

² *Vide supra* Vol. I, Pl. XI.

Kircher's example has been followed by CANTELLI, 1683. On his map¹ we find a meridional range which may be said to represent the Kashgar Range or rather the whole of the Pamir Mountains, and which he calls Sacritma. To the west of it, Serpanil is marked as a town or fortified place, and Sarcil is both a town and province. Ciecialith is missing.

East of Sacritma we have Tamgheren and Iaconich. Farther north is Kasgar or Cascar placed as if belonging to the drainage area of the Iaxartes. There is no Hiarchan.

DE WITT places Iaconich at a considerable distance east of Iarchan and N. E. of Cascar. CORONELLI, 1695, seems to regard the problem as hopeless, but he has still a Iaconich south of Cascar.

DELISLE, 1706, has, with a double line, entered the itinerary of Goës together with most of the names mentioned by him. Regarding the mountains Sacritma and Ciecialith, he has felt too uncertain and left these names out. But Sarcil he regards as a mountainous country. This is curious as on his map of 1705² he had both Sacritma M. north of Petit Tibet, and M. Ciecialith farther N. E. On his map of 1723 where the orography has taken more solid features, he places Ciecialith as if it belonged to an important mountain knot, from which one range starts to the west between Amu-daria and Sir-daria, another to the east corresponding to the Kwen-lun, a third to the south joining the former with Mont Ima. North and N. E. of Ciecialith he has Tanghetar, Iaconich and Yarcen.

A German map-maker T. C. LOTTER has, without any originality, published a map of exactly the same type as the map of Delisle, 1723. It is interesting in so far as it contains the route of Goës and nearly all his geographical names. He has Mons Sacritma between Fergana and Vagian (Wakhan), Serpanil just north of Vagian, Sarcil north of Fergana, the uppermost Sihon or Sir-daria flowing along the eastern base of Mons Ciecialith and Tanghetar as a town at the bank of this river.

STRAHLENBERG has not ventured to make too much use of Goës' experiences, especially as some new information regarding the Pamer, Belur and Mus Tag had been gained which could not be brought into harmony with the missionary's route. Still he has kept Jakonig just west of Ierken and, curiously enough, Sarikol between Tamgeran and Kargalagga (Karghalik) or in the plains of Bucharea Minor.

The influence of Strahlenberg is very easy to recognize on A. ARROWSMITH'S map of Asia 1801,³ though seventy years lay between them. The latter still has

¹ *Vide supra* Vol. I, Pl. XXXIII.

² *Vide supra* Vol. I, Pl. XL.

³ *Vide infra*.

Jakonig W. S. W. of Yarchand, and Sarikol, on the plains, between Tamjeran and Kargalaga.

In his Mooz Taugh or Karrakoorrum Mountains MACARTNEY has a Tunjee Tar, noticed by Yule, but probably not to be regarded as a remainder of Goës' itinerary. The same name, under the form of Tangi Tar, is to be found on the Chinese sheet of Stieler's Handatlas for 1826.¹ Berghaus, 1843,² has adopted some of the names quoted by Ritter from Klaproth's map of 1836. On DUFOUR'S little map of 1846, Sere-koul is still to be found as a town in the western part of Eastern Turkestan.³

The *New Map of Asia* published by C. F. CRUCHLEY in 1855 was already very much antiquated at its appearance. There we still find three of Goës' names, Tamgeran, Sarikol and Jokonig as villages west and S. W. of Hyarkan. On P. S. LUMSDEN'S *Rough Sketch of Caravan Routes etc.*, 1862, we finally find the Chikhiklik Kotul in the Sirikool range. In KEITH JOHNSON'S Atlas of the same year, the Yarkand-daria itself is called Sir-i-kol. The pass, which on Lumsden's sketch map was called Chikhiklik Kotul, is to be found on Major T. G. MONTGOMERIE'S map of 1871, illustrating the survey made by the »MIRZA« in 1868—69. But here it is attached to a part of a range and called Chichik Dawan Mts. Sirikul Tash-kurgan is used as *one* name, being the principal place in Sirikul. The Mirza seems to have followed the same way as Goës for a considerable part of his journey. Montgomerie says: »From Sirikul the Mirza marched down to the main Sirikul River, which he crossed on the ice; he then made his way over the Chichik Dawān Range by a very high and steep pass, covered with snow and ice, probably about 15,000 feet above the sea. After five very hard marches over snow, the party arrived in the Keen Valley.» This becomes more clear when we read: »The Valley of Sirikul or Sirikol, as the Mirza pronounces it, has, hitherto, been only known by hearsay, it is apparently a fine valley, quite walled in with mountains, and having little more than a gigantic chasm, *viz.* the Tangitār, for the exit of its river.» The Mirza's Keen Valley »is obviously the Keng-kol. His description is, in several points, rather like the narrative of Goës.»⁴

¹ *Vide* Vol. III, Pl. X.

² *Vide* Vol. III, Pl. XIII.

³ *Vide* Vol. III, Pl. XVIII.

⁴ T. G. Montgomerie: *Report of »The Mirza's« Exploration from Cabul to Kashgar, Journal Roy. Geogr. Soc.* 1871, p. 132 *et seq.*

CHAPTER V.

DIEGO D'ALMEIDA AND ANTONIO DE ANDRADE.

At another place I have discussed DIEGO D'ALMEIDA to whose journey Dr. J. CHARPENTIER of Uppsala has kindly directed my attention.¹ It therefore would be superfluous to enter upon him again at greater length. On the other hand I think it is necessary to insert here the only short passage that so far is known regarding the journey of the Portuguese traveller who seems to have been a layman at Goa. This passage is to be found in an extremely rare book written by the Augustine Friar, DOM ANTONIO DE GOUVEA and published at Coimbra in 1606. It was translated into Spanish by F. MUNOZ, and finally into French by J. B. DE GLEN.² What Gouvea has to tell regarding the journey of d'Almeida is of great interest, for it contains a description of the first known journey to Ladak, a journey that was accomplished before GOËS had started for Central Asia. To us it is especially interesting that Gouvea mentions Little Tibet, a Country belonging to the Kara-korum. So far as can be judged from MONSERRATE'S excellent map and wonderful text, the Jesuits at Goa had a much deeper knowledge of the mountains north of India than the map-makers in Europe. On ORTELIUS' map, *Persici sive Sophorum regni typus*, 1570,³ the feeders of the Indus come down from Dalanguer M. and Naugracot mons, south of which Kashmir is situated. As Pl. III, I have here

¹ *Geografiska Annaler*, Vol. I, Stockholm 1919, p. 269 *et seq.*

² *Histoire orientale des grans progrès de l'église Cathol. Apost. & Rom. en la reduction des anciens Chrestiens, dits de S. Thomas, de plusieurs autres Schismatiques & Hérétiques à l'union de la vraye Eglise. Conversion encor des Mahometains, Mores & Payens.*

Par les bons devoirs du R.me Illust.me S. I. Don Alexis de Meneses, de l'Ordre des Eremites de S. Augustin, Archeuesque de Goa, et Primat en tout l'Orient.

Composée en langue Portugaise par le R. P. F. Antoine Goue & puis mise en Espagnol par venerable P. F. François Munoz, & tournée en François par F. Jean Baptiste de Glen, Docteur en Theologie, tous Religieux du mesme Ordre.

En Envers, par Hierosme Verdussen, Imprimeur Juré. Aux dix Commandemens, 1 an 1609. Auec Privilege. Buschere.

³ *Vide supra*, Vol. I, Pl. XXIII.

a reproduction of a simplified copy of the map of Ortelius, engraved by PETRUS KAERIUS,¹ showing that the existence of mountains in the region of the uppermost Indus was known.

However, the following is the passage in question as it appears in Gouvea's introduction p. 11 et seq.:

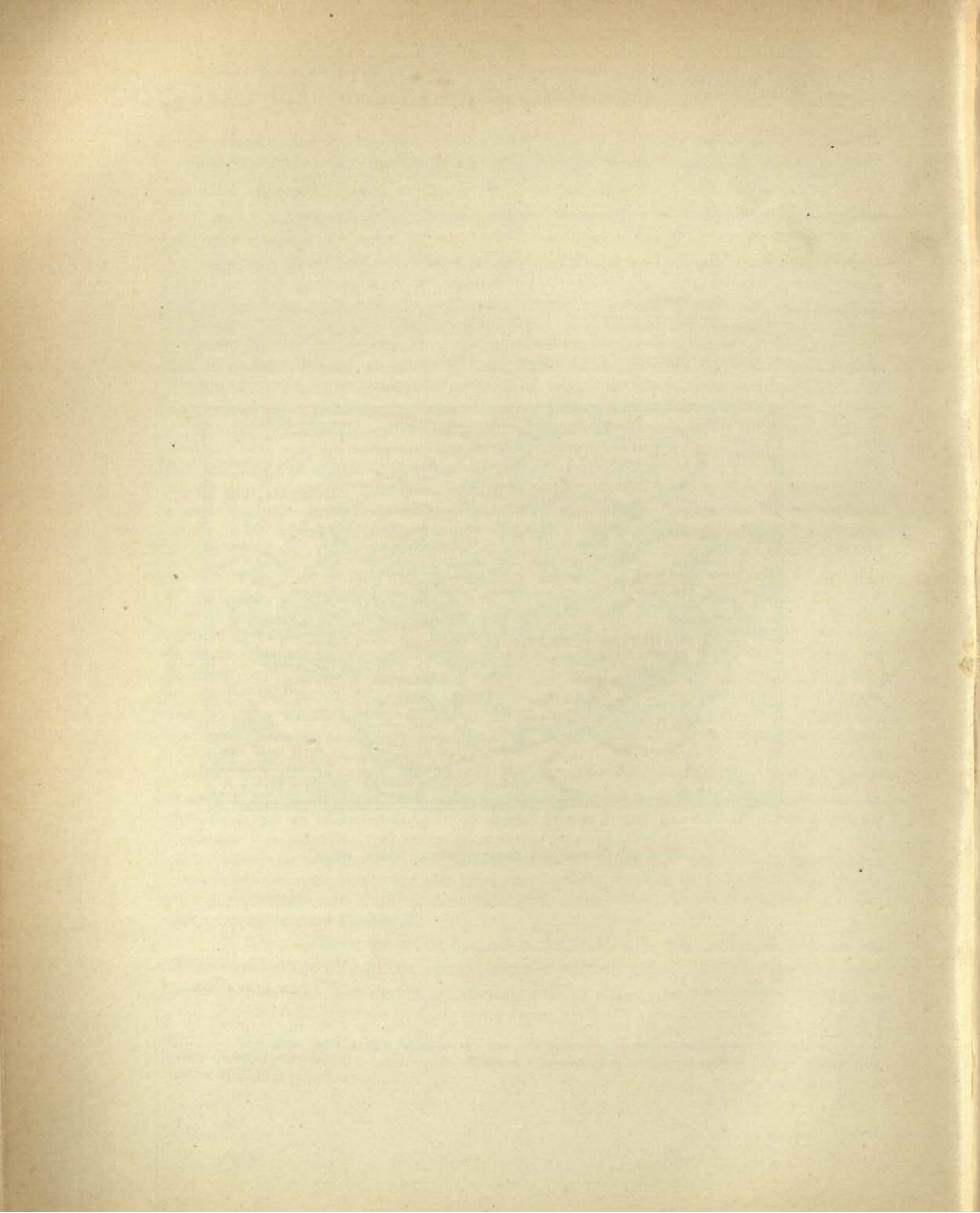
Que si voulons parler de l'Estat, le Roy de Thibete, vulgairement est nommé Tammi-guia & en tout le Royaume n'est tolleré infidèle quelconque, fors quelques marchands, encor en passant seulement. La principale forteresse ou réside le Roy (qui est un grand & puissant Prince Seigneur absolu) pour son nom a Babgo. Le Royaume est riche en or, pierreries, dont les femmes s'aornent, s'attiffent & vestent pompeusement. Les habitants sont de couleurs blancs, en guise de Iaos, bien au reste conditionnez. Il y a beaucoup d'Eglises bien parées & aornées de tableaux & images de nostre sauveur Jesus Christ, de nostre Dame, des glorieux Apostres. Ils ont aussi grand nombre de gens d'Eglise, lesquels ny plus ny moins que les nostres gardent continence: & en vestements & guises d'habits, leur sont fort semblables, hormis que ceux la portent la teste toute rase; l'Euesque est par eux nommé Lamhao. Celui qui l'est au present, est en grand estime de sainteté envers ces peuples: de fait ils referoyent beaucoup de miracles faicts par iceluy, & entre autres choses notables, on raconte celle-cy: que ce saint Prelat fait sa demeure le plus ordinaire en un desert separé de la ville par un grand fleuve, vivant en grande austerité & penitence: & quand il vient à la ville, es jours plus solempnels, & Festes principales, pour y célébrer le Divin service, il n'a que faire de navire ou de barque, ains seulement il tend son manteau sur le fleuve, ou une peau de Cheure, & se siet desus, & passe ainsi, & arrive à la ville sans en estre mouillé & baigné. Cecy n'est pas un conte fait a plaisir, car ainsi parfaitement le conta le susmentionne Diego d'Almeida Portugais, devant l'archevesque l'an 1603. & mesme ledict Seigneur archevesque (qui delors pensait des moyens de leur salut, est comment on pourrait envoyer ouvriers a une si belle maison) pour mieux s'en acertener, les fit jurer sur les saints Evangiles, que tout ce narre etait vrai, & n'avait rien de controuvé. Pour le demourant comme ce Diego était homme laïque et non entendu ou pratiqué és choses ecclesiastiques, il ne sçeut donner pour lors autres instructions de leurs cérémonies, ou de leurs erreurs: s'il y en a, on espère que ce bon Religieux frère Benoit de Goës, lequel n'aguerres avons dit avoir été envoie en cette region, en rapportera pleine & entière information, attendu qu'on tient pour indubitable que cette chrétienté là, est celle dont parloyent les Mores en la Court du grand Mogur & non pas celle du Catayo, qui est beaucoup plus longtaine. Et diray encore cecy, que pardela ce royaume de Tibete, dont nous parlons au present il y en a encore un autre, appelle le petit Tibete, laquelle est sous la puissance & domination des Mores de la Ceita de Xaa Roy de Perses, & pourra être par adventure ceste Thibete, dont parle Paulus Venetus en son livre, sans faire mention, que la y soit aucune chretienté.

It is not difficult to prove beyond a doubt that it was to Ladak and not to Tibet that DIEGO D'ALMEIDA carried out the journey, related in such an abbreviated form by GOUVEA. The French translation, which is taken from the Spanish translation,

¹ This little map accompanies *Asia, sive Historia Vniversalis Asiaticarum gentium et rerum domi forisque gestarum . . . auctore Jo. Baptista Gramaye praeposito arnhemieni . . .* Antverpiae, Anno MDCIII, p. 328.



Map of Persia and northwestern India, 1604.



probably contains several misprints. I have only seen the French edition. The king of Tibet is called Tammiguia and his capital, Babgo. The real names must be Nammiguia and Basgo, and Basgo was indeed the capital of Namgyal who was king of Ladak at the time of d'Almeida's journey.¹

Somewhat puzzling are the words: »le susmentionné Diego d'Almeida», for nothing has been said of him before p. 11 of Gouvea's work. They prove, however, that Gouvea knew something more about d'Almeida, though he seems to have forgotten that he has not mentioned him on the first pages of his introduction. Probably nothing more will be heard of him except the short passage quoted above.

Father JEROME XAVIER, who had passed many years in India, had tried to get reliable information about the road to Xatai or Cathay, and he had made systematic inquiries.² In the collection of letters from early Jesuit missionaries brought together by Father JOHN HAY, some of the results are to be found. The object was to determine and make sure of the road as far as possible, before Goës was sent out on his adventurous enterprise. In one of Xavier's letters, also containing information of no special interest to us and given by »a certain merchant», we read the following passage:³

Haec (inquit Xauerus) summa est eorum, quae mihi mercator ille narrauit. Ego verò existimo, omnium esse facillimum. Regis hujus Achebaris opera in hac peregrinatione vti. Nam Lahore proficiscentibus prius Caximir, eiusdem Achebaris Regnum occurrit. Hinc ad Regnum Rebat, quod Regem habet Achebaris peramicum, rectà si contendes, eius litteris fretus, facilè ad ciuitatem Caygarem peruenies, inde ad primam ciuitatem Xatai, quae Christianorum est, paucorum milliarium interuallum exstat. Mihi quoque dum in Caximire agebam, nunciatum est, esse in Regno Rebat multos Christianos & Ecclesias cum sacerdotibus & Episcopis. Ad hos ego è Caximire litteras scripsi tribus viis lingua Lusitana & Persica: cum illi rescribent faciam V. R. certiore. Lahore, 7. Cal. Augusti, Anno 1598.⁴

Or, in other words, a traveller from Lahor first comes to Kashmir and then straight on to the kingdom of Rebat or Tebat, Tibet. The king of this country is a great friend of Akbar. From Rebat one easily arrives at Caygar or Kashgar. This is the famous old road across the Kara-korum Mountains, either by the Kara-korum Pass or by some of the neighbouring passes. It is clear enough that the

¹ Cf. further loc. sup. cit. *Geogr. Annaler*, where I have an article entitled: *Early European knowledge of Tibet*, p. 304 et seq.

² The head of the detachment of missionaries which, in 1594, at the request of AKBAR THE GREAT was sent to his court, was JEROME XAVIER. He was accompanied by BENEDICT GOËS and EMANUEL PINHEIRO. During his search for information regarding the ways to Cathay Xavier was told by well informed people that »merchants were in the habit of going from Lahore to Kashmîr, and thence by the Kingdom of Rebat, the king of which was in alliance with the Mogul, they went straight to Kashgar, from which it was said there was a direct and easy route to the first mercantile city of Cathay . . . » Yule, *Cathay*, IV, p. 172 et seq.

³ Cf. Vol. I, p. 159.

⁴ *De rebus iaponicis, indicis et pervanis, epistolae recentiores*. A Ioanne Hayo Dalgattiensi Scoto Societatis Iesv Antverpiae MDCV, p. 797.

merchant who had given this information, knew the road by personal experience, and that he did not mean that to reach Kashgar one had to travel *viâ* Lhasa or any other place in Great Tibet. But when the same merchant told Xavier that from Kashgar the distance to the first Cathayan city inhabited by Christians would be only a few miles, he proves that he did not know by personal experience anything about the road from Kashgar eastwards. When in Kashmir, Xavier had been told that there were many Christians and churches with priests and bishops in the kingdom of Rebat, exactly the same story as was afterwards told by Diego d'Almeida.

The king of Rebat mentioned by Xavier as a great friend of Akbar, is SENGGE NAMGYAL, about 1590—1620 A. D. who had inherited the warlike spirit of his grandfather Ali Mir, and who had a Mohammedan mother. He made war, but only against the east, different parts of Guge, and proceeded on his campaigns even to the northern slopes of the Kailas and to Namring.¹ With his neighbour to the S. W., Emperor Akbar, he kept peace. His kingdom was much bigger than the present Ladak, embracing the whole western part of Tibet proper. The name Rebat or Tibet was only used by the Mohammedans who always, as nowadays, meant Ladak, particularly Leh. Sengge Namgyal is the builder of the famous Leh castle and of the Maitreya monastery at Basgo. The latter place was then of much greater importance than now. At the time of d'Almeida's visit, the king resided at Basgo, or Babgo, as he writes the name.² D'Almeida also told the Fathers at Goa that beyond Tibet or Ladak there was another kingdom, Little Tibet, Baltistan, which was under the power of the Shah (Abbas the Great) of Persia.

In Father HAY'S book we find another letter from XAVIER, also dated 1598, in which there is a very interesting piece of physical geography and a passage containing a rather unusual piece of observation on natural history,³ which, however, as far as the wild-geese are concerned, is wrong:

Hic res nostrae missionis persequar, quae in Cascimirano Regno frater noster Benedictus Gois, mecum Regem comitatus, effecerit, breuiter comprehendâ. Regio haec perfrigida est, eamque algidam magis reddunt altissimi, quibus cingitur, montes: sed cum Regno Tebat (quod illi ab Oriente adjacet versus Scetaium vel Cataium vbi est ille insolens & nominatissimus trecentorum millium murus, qui Tartariam à Sina diuidit & separat) collata, temperatior, ita vt à gelidis montibus Regni Tebat mense Maio gregatim & per acies infinita prope anserum syluestrium agmina aduolent, & in flumina, quae iuxta vrbem Cascimirum tanquam calidam magis menant & fluunt, se immittant.

The region of Kashmir, as compared with India, and especially during the winter, may indeed be said to be cold. And it may also be said that this cold is

¹ Rev. A. H. FRANCKE, *A History of Western Tibet*, London 1907, p. 96 *et seq.*

² The Tibetans write the name Babs-ngo, though it is pronounced Basgo. Cf. G. Schulemann: *Die Geschichte der Dalailamas*, Heidelberg 1911, p. 128.

³ Op. cit. *Transcripta ex literis P. Hieronymi Xauier Societatis Iesu, Anno 1598, & P. Emmanuelis Pigneiro, Anno 1598.* P. 863.

caused by the very high mountains surrounding this country. But if it be compared with Tebat, *i. e.* Ladak, it may be said to be more temperate. Xavier's mistake comes in when he says that the nearly endless flights and lines of wild-geese, which in the month of May arrive at the waters of Kashmir, come from the icy mountains of the kingdom of Ladak. Further, Xavier states that Tebet, *i. e.* Ladak, is situated east of Kashmir, which is correct. His conception of Cathay and China, on the other hand, is very diffused. He knows that the Great Wall divides and separates Tartaria from China, but when he says that Ladak is bordering upon Kashmir in the direction of Cathay, he shows that he has no idea of the extension of Ladak, nor of the situation of Cathay. It therefore was very important that Goës should go out and clear up the problem.

* * *

In the first volume of this work,¹ we have dealt with ANTONIO DE ANDRADE so far as his relation to Lake Manasarovar is concerned. We have seen that the purely geographical information he brought back was very meagre and that he did not know very much of the country beyond Tsaparang. The narrative of his second journey, which has to be mentioned in this historical account though the journey did not touch the Kara-korum Mountains at all, is, from a geographical point of view, even poorer than that of the first journey.

Even with the scanty geographical information he gives, Andrade, without saying so directly, made a difference between Great Tibet and Little Tibet, the latter called by him simply Ladak. Of the former he only visited Tsaparang and its surroundings. He begins his description »On the return to the kingdom of Tibet» as follows:

Vostre Paternité aura sçeu par celle que i'escruiis au Pere Prouincial, ce qui se passa en l'an 1624. lors que ie me resolut d'aller au grand Tibet (ou Royaume du Puissant comme ils l'appellent) laissant donc tout ce que ie raconté de mon partement & de mon retour, pour lors arriué que ie fus en la ville d'Agra, qui fut sept mois apres que i'en fus party (car autant me fallut-il de temps pour ceste entreprise.) Les Superieurs des Indes informez du succez de ce voyage, iugerent à propos que l'année suiuite ie retournasse avec vn autre Pere de la Compagnie au Tibet, d'où ie les aduertirois plus particulièrement du fruit que l'on peut tirer de ces quartiers là, afin d'y enuoyer des ouuriers au besoin pour la plus grande gloire de Dieu. Nous partismes donc d'Agra au commencement de Juin, 1625, deux Peres que nous estions pour aller en ce lieu là, & bien qu'il nous falut souffrir beaucoup & surmonter de Grandes difficultez, neantmoins elles ne furent telles que celles du voyage precedent, entre ces trauerses celle-cy ne fut pas la moindre, que l'on nous osta la plus grande partie de si peu que nous portions, encores que nous eussions lettres du Roy de Mogor qui ordonnoit aux petits Roys des Montagnes, qu'ils nous donnassent passage libre, enfin nous arriuasmes en ces terres au mois d'Aoust.²

¹ P. 162 et seq.

² *Histoire de ce, qui s'est passé au Royaume, du Tibet. Tirée des Lettres escriptes en l'année 1626. Addressée au R. P. Mutio Vitelleschi General de la Compagnie de Iesus. Traduite d'Italien en François par vn Pere de la mesme Compagnie. Paris MDCXXIX, p. 2 et seq.*

Andrade here speaks of Great Tibet, and in a later passage, he mentions Ladak. Diego d'Almeida distinguished between Tibet, *i. e.* Ladak, and Little Tibet, *i. e.* Baltistan, but he did not mention Great Tibet.

The first journey was begun from Agra on March 30th, 1624, and in the beginning of August he reached Tsaparang. On his second journey he started from Agra in the beginning of June 1625, and reached Tsaparang on August 28th. The first journey took over four months, the second less than three months. The first journey was begun more than two months earlier than the second, indeed too early in the year, the consequences of which were the great hardships on the Mana Pass and in its surroundings. This difference between the two journeys is nearly the only fact related by Andrade from the second journey, as quoted above or as it is in the Italian edition: »e se bene patimo molto disastri, e ci convenne superare molte difficoltà, non furono tuttauia come le passate».¹

The next chapter has the heading: Des qualitez des Pays du Tibet & de la diuersité des Royaumes attenans. It begins:

Le Tibet (ou Puissant) car on l'appelle en l'une & en l'autre sorte, ainsi que nous avons dit cy dessus, comprend le Royaume de Cogué qui est celuy auquel nous demeurons à present, celuy de Ladac, de Moriul², Rudoc, Vtsana & deux autres qui sont vers l'Orient, tous lesquels avec le grand Royaume de Sopo, qui confine d'un costé la Chine, & de l'autre la Moscouie, font la grande Tartarie. Cét Empire de Sopo est fort grand, & comme l'on dit, a plus de cent petits Roys tributaires. Ce tant renommé Cataio, n'est pas un Royaume particulier, mais une grande ville appelée le Catai, metropolitaine d'une certaine Prouince voisine de la Chine, de laquelle ils disent estre Seigneur le Grand Monarque de Sopo: en tous ces Royaumes ils tiennent la mesme secte du Tibet sans aucune difference, comme aussi les habitans different ils bien peu des Tibetans pour le langage³

Tsaparang thus, according to ANDRADE, belonged to Guge in the days of SENGGE NAMGYAL and his son DELDAN NAMGYAL (1620—1640).⁴ Tibet »or Powerful», which he in his preceding chapter has called Great Tibet, included the kingdom of Guge, the kingdom of Ladak, the kingdom of Mariul, Rudok, Utsang and two others farther east.⁵ Here Andrade makes no difference between Ladak and Tibet Proper — politically. In the beginning of Deldan Namgyal's reign, his kingdom only reached as far as Maryum-la, though he extended it a considerable distance eastwards in his later days.⁶ At the time of Andrade's second journey only

¹ *Lettere annue del Tibet del MDCXXVI e della Cina del MDCXXIV. Scritte al M. R. P. Mutio Vitelleschi, generale della Compagnia de Giesu.* In Roma 1628.

² In the Italian edition it is correctly spelt Mariul.

³ *Op. cit.*, p. 6 *et seq.*

⁴ Or Singi Namgyal, the Lion-king, the same name as in Singi-tsangpo = the Indus.

⁵ AL. CSOMA DE KÖRÖS reckoned Gugé to Ngari. — *A Grammar of the Tibetan language*, Calcutta 1834, p. 197. Guge may perhaps be taken in a political and Ngari in a more physical sense.

⁶ FRANCKE, *op. cit.*, p. 101 *et seq.* Francke says: »During the days of Deldan the mission of the Jesuit Andrade to Tsaparang in Guge seems to have taken place.» *Ibidem* p. 103.

Guge, Ladak and Rudok of the names mentioned, belonged to the kingdom of Deldan, *i. e.* Ladak in a wider sense. The king of Chaparangue, Andrade's friend and protector, was, therefore, probably only a governor or some tributary prince. Utsang, on the other hand, and the two other kingdoms farther east, perhaps Kam and Amdo, belonged to Lhasa, or Utsang, as Andrade calls this city. He seems to have been unaware that Maryul is the same as Ladak.¹

Nor has he a clear conception of the great countries farther east. The famous Cataio is only a town in a province in the vicinity of China: »Quel tanto celebre Cataio, non è Regno particolare, ma è vna Città grande, chiamata Katàì, capo d'vna certa Prouincia molto vicina alla China.» Sopo, or more correct, Sog-po is native of Mongolia, though he means Mongolia itself. It is curious that this clever Jesuit who, however, only touched the southern part of Guge, could speak of a »Novo descobrimento do Gram Cathayo».

Andrade seems also to have had a very vague idea of what we use to call Southern Tibet. He does not know, at least he never mentions, the name of Lhasa, but he knows the existence of a sacred city which he calls Vtsang, the ordinary combination of the names of the two provinces U and Tsang. In his imagination this city seems to be at a very great distance, for he says that Lamas who have been there acquire a high merit, of the same kind as the Mekka pilgrims who become Hajjis. »Entre les Lamas ceux qui ont esté en pelerinage à vn certain pays qu'ils appellent en leur langue Vtsang sont grandement honorez de tous, de sorte que lors qu'ils passent par les ruës le peuple court la teste descouuerte, & baissent la teste attend que le Lama luy mette les mains dessus, pensant acquerir de grands pardons, par ceste imposition de mains.» He also talks of Utsang, *i. e.* Lhasa as a religious high school.... »la ville de Vtsang, qui est comme vne Vniuersité, où ceux qui estudient reçoient apres plusieurs années les degrez, & au retour de là ils sont estimez ténus en reputation de Docteurs.» He writes to Father VITELLESCHI and tells him about the churches and images in Lhasa, and about a royal marriage which to his mind opens up magnificent perspectives for the future propaganda of the Jesuits.

Quelques-vns natifs de la ville d'Vtsang, où il y a plusieurs Eglises, m'ont dict qu'il se voit en ces Eglises beaucoup d'Images semblables aux nostres, qui doute que le Ciel ne vueille que bien tost elles ne soient toutes consacrées au cult du vray Dieu ? & de fait, le Roy a enuoyé faire demande au Roy d'Vtsang de sa fille, pour la marier avec le Prince son fils, ce qui sera comme i'espere conclud ceste année, de laquelle il y a desia plusieurs mois passez. Surquoy le Roy m'a dict, que par ceste alliance & traicté on asseureroit

¹ CUNNINGHAM says: Ladak, in Tibetan La-tags, is the most common name of the country; but it is also called Mar-yul, or Low-land or Red-land. He quotes Csoma and Hüen-chuang. — *Ladak*, London 1854, p. 18. CSOMA DE KÖRÖS writes Mar-yul, »the low Country, Ladak». — *Essay towards a Dictionary Tibetan and English*, Calcutta 1834, p. 130. — SARAT CHANDRA DAS has: »Mar-yul the low country, *i. e.*, in the valley of the Indus; name given to La-dwags (Ladak)». *A Tibetan-English Dictionary*, Calcutta 1902, p. 955.

le voyage aux autres Royaumes, ausquel desia les Peres qui sont venus se preparent, s'addonnant avec tres-grande diligence, & à ma consolation à l'estude de la langue.

He has even heard of Dalai-Lama, for he says: »... à Vtsang le Lama Majeur offroit pain & vin de raisin». Once he writes that the king of Tsaparang had the prince of Ladak as his guest. »Ceste nuict-là il eut en sa compagnie le Prince de Lodacca, seigneur d'un royaume voisin, qui s'appelle ainsi, & plusieurs autres personages de marque.»¹

One gets the impression that he does not know that Ladacca is the same country which he at an earlier occasion has called Ladac. Should the Prince of Ladak be Deldan Namgyal himself? At any rate travellers arrived from Ladak to Tsaparang, and thus Andrade could easily have obtained news from countries situated both south and north of the high Kara-korum. But he has not used these opportunities, though DIEGO D'ALMEIDA more than twenty years before had brought important news from Ladak to the Fathers in India. D'Almeida, however, does not use the name Ladak. He uses the name Tibet, and Andrade did not know that the Ladak of which the Tibetans of Tsaparang spoke to him, was the same as the Tibet which d'Almeida had visited and which had been called so by the Moham-medans whom he had met on his road. For at Tsaparang only the name Ladak was in use, as is still the case.

Neither d'Almeida nor Andrade throw new light on the mountains to the north, as they did not proceed sufficiently far into the interior of the country. The former has not left any signs at all of his journey; of the latter only the name, Chaparangute, slowly began to make its appearance on the maps, for instance on DE WITT'S map from the middle of the 17th century, and on WITSEN'S of 1687. Its correct location under the form of Chaparangue, it first received on DELISLE'S map of 1705. Then it disappeared again at intervals, as *e. g.*, on STRAHLENBERG'S map of 1730.

¹ The name Lodacca is a misprint. In the Italian version it is said: »Prencipe di Ladacca, Signore die vn Regno vicino».

CHAPTER VI.

THEVENOT, KIRCHER AND OTHERS.

Geographers in Europe continued to use the common classical names for our mountains, though the modern names Naugracot and Dalangver and even Kwen-lun also appeared in several geographical books. Two or three quotations may be sufficient. Speaking of the Seres, PETER HEYLYN says:

Finally, These and they of Zagataie are the most honourable people of the Tartars, indifferentlie civill, lovers of arts, both mechanicall and civill, and inhabiting diverse faire Citties. The chiefs are 1 Caraian, where the women vse to guild their teeth, 2 Tebeth, famous for her abundance in Corall. 3 Cambalu The principall riuers of this Country (India) are, 1. Indus, the boundary of the Persian and Indian Empires: which hauing his head in the mountaine Caucasus, now called Naugrariot; etc.¹

ADAM OLEARIUS has the following passage:

Sablustan lieget ferner nach Osten, dessen Einwohner beym Curtio Paropannisadae seynd genennet worden, nemblich von dem herumliegenden sehr hohen Gebirge, welches ein Theil vom Taurus ist und Paropamisus genandt worden, ist mit vielen Hölzungen umgeben.²

When THEVENOT mentions the mountains of Kwen-lun, one at first wonders whether he really had any knowledge of the gigantic system to the north of the Kara-korum, but one soon finds that he means the original old Chinese Kwen-lun. Speaking of the Yang-tse, he tells us that this river has several names;³ the first is Minkiang, a name which it got from the Min-mountains, »where it has its source». These mountains, in the western-most part of Suchuen, stretch far to the west, so far as to Sifan or the country of Priester John. — »Le fleuve d'Hoang doit estre mis le second; je le nomme safrané ou jaune Voicy comment les Chinois le décrivent. Le fleuve d'Hoang prend sa source d'un lac entre les montagnes de Quenlun qui sont au Midy; ceux du pays appellent ce lac Otunlao Ce fleuve est donc le deuxieme de la Haute Asie Pour moy i'estime que les montagnes de Quenlun

¹ Peter Heylyn: ΜΙΚΡΟ 'ΚΟΣΜΟΣ. *A Little Description of the Great World*. Third Edition. Oxford 1627, p. 659 and 665.

² *Vermehrte Neue Beschreibung den Muscowitischen und Persischen Reyse etc.* Schleszwig MDCLVI, p. 548.

³ *Relations de divers voyages curieux* Paris 1666, p. 19.

où il prend sa source sont les montagnes Amasiennes, & qu'elles ne sont pas éloignées de la seconde ville royale du grand Mogol, qu'on nomme Laor, ou bien du royaume de Tebet, mesme la situation de ce pays m'oblige à croire que les rivières de Siam & du Pegu, le Gange de Bangala, le Meson des Laos, & l'Histor de Cambogia prennent leur source dans ces montagnes: aussi ceux de la Chine assurent que la plupart des grandes rivières qui vont au Midy y prennent leur source.»

This passage proves how little was really known of the country which Father MARTIN MARTINIUS seems to have been the first to call »la Haute Asie«, an expression so common in later years. The Yellow River comes from the Kwen-lun. The Kwen-lun is the same as the Amasian Mountains which are situated not far from Lahore and the kingdom of Tibet. The situation of Tibet made it probable that the rivers of the farther Indian peninsula came from the Kwen-lun, — which was believed to be situated not far from Lahore. However, the situation of Tibet makes it probable that the rivers of Siam and Pegu have their origin in the Kwen-lun Mountains. It is worth noting that the fabulous Lago de Chiamay is, in this connection, not mentioned as their common source. In a later passage, however, the lake returns to its old place.

Of the kingdom of Sifan we read:¹ »Le mot de Sifan parmy les Chinois, comprend les frontieres de leur Empire qui sont vers l'Occident, mais principalement celles qui s'étendent de la province de Xensi, à Iunnan, où sont compris les pays d'Usuçang, de Kiang, & de Tibet; ces noms comprennent plusieurs peuples, ceux de la Chine disent qu'il y en a de plus de cent Nations. Sur ces frontieres sont les royaumes de Geo & de Cangingu que le Venetien appelle le royaume du Prestre-Jean. Les chinois disent que ce Royaume est borné par les montagnes de Min, & par la rivière Jaune qui y passe. Ces montagnes ont beaucoup d'étendue, & se joignent enfin à celles de Quenlun, autrement les montagnes Amasées d'où la rivière Saffranée tire son origine. — Là mesme, vers le Couchant, il y a un fort grand lac qui s'appelle Kia d'où vient le Gange & les autres rivières que j'ay mises dans la carte. — Le Royaume de Mien suit apres celui de Tibet, il est situé à l'Orient de Bengale, & s'étend iusques au Midy de la Province de la Chine nommée Iunnan.»

This description corresponds very well with the map in Thevenot's work of which I have given a reproduction in Vol. I (Pl. XXXI). The Shamo or Lop Desert is represented as a long narrow strip, like a river bed N. W. and north of China. Hwang-ho correctly begins from two lakes, called Singsieu and Sosing L., instead of Jaring-nor and Oring-nor (Sosing may be the same as Oring) or Mtso-khchara and Mtso-khnora as Kozloff calls them. But the whole upper part of the Hwang-ho

¹ Op. cit., p. 32.

has been turned down 90° to the south; the two lakes and the upper part of the river form a line running north and south, instead of east and west.

This map dates from the time before that of the Jesuits of Kang Hi. One can easily see that the farther west the more uncertain becomes the map. It was known that the river came from Odon-tala and the two lakes, but the situation was not determined. The whole country west of China proper, is, so to speak, pressed together. So, for instance, Samarkand is made a part of Tartary and Samarcandae Pars is immediately west of the great northern bend of Hwang-ho.¹ Thus Xamo Desertum, or the desert of Gobi, is situated in this Samarcandae Pars and just south of it is Mare nigrum Sinis Cinghai or Koko-nor. South of Koko-nor is Tibet Regnum and S. S. E. of it are the two lakes, at the source of Hwang-ho, and immediately east of them, is the range of mountains called Quenlun. Kiang R. and Usucang R., as well as Tibet R., are parts of Sifan, which includes everything Tibetan. Between Tibet and Kiang is the mysterious lake, Kia L., from which the Ganges and four other rivers begin.²

A tremendous area of the interior of Asia has been pressed together in a comparatively narrow space of country west of China proper. If we give the Upper Hwang-ho the latitudinal direction which it ought to have, instead of the meridional as on the map, and if we let the parallel ranges west and east of it follow, the Quenlun M. will correspond to the Bayan-khara-ula and the western range to the Amne-matchin, both being parts of the Kwen-lun System. Or, in one word: the map contains many real geographical features, though they have been placed in confusion and disorder.

In Thevenot's work just quoted, there is a map: *Description de la Partie des Indes orientales qui est sous la domination du Grand Mogol*; on which Chishmeere is situated at the sides of the Indus, and the Indus is coming from M. Caucase. East of Kashmir is Kakares and directly north of Caucasus is Usbeck Tartaria and Tartaria. The Ganges comes from the Caucasus and enters the head of a cow from whose eyes and nostrils the water again rushes out to fill a little lake, at Hardware, which is represented as a kind of secondary source of the river. So far as the northern parts of the peninsula are concerned, even Ptolemy is better than this map.

On a map of eastern Asia, in Tome III of the same work, we find the same lake east of the Ganges, from which several rivers go southwards. It is supposed to be situated in Si-fan, just a little east of Kiang Regnum, south of which is Usucang Regnum (Utsang?). North of the lake is Tibet Regnum and Xamo Desertum.

On MARTINI'S map reproduced by THEVENOT,³ the Quenlun M. is entered east of the two lakes from which the Yellow River takes its origin. Regarding

¹ Cp. Vol. I, p. 193.

² Cp. Vol. I, Chapter XXV.

³ Vide Vol. I, Pl. XLVI.

Tibet, he places at least a part of it to the east of Kashmir, thereby indicating that he chiefly means Ladak. In his chapter on Kashmir, he says: Le Royaume ou Province de Cachmir, a vers l'Occident le Caboulistan; A l'Orient une partie du Tibet: Au Midy la Province de Lahors; & au Nord la Tartarie. Mais ce sont là ses limites les plus éloignées, car il est borné & entouré de tous cotéz par des montagnes, & l'on n'y peut entrer que par des détroits & des défilez. Ce Pays a quelquefois appartenu aux Rois du Turquestan, & il est de ceux que l'on appelloit Turchind, c'est-à-dire l'Inde des Turcs, ou la Turquie des Indes. — Les eaux des montagnes qui l'environnent, fournissent tant de sources & de ruisseaux, qu'elles rendent ce Pays le plus fertile des Indes; & après l'avoir agreablement arrosé, forment une riviere appelée Tchenas, qui ayant communiqué ces eaux pour le transport des marchandises à la plus grande partie du Royaume, en sorte par une rupture de montagne, & se va decharger près la Ville d'Atoc, dans l'Indus.¹

Thevenot, therefore, regarded the country to the north of Kashmir as belonging to Tartary. Still in those days Tartary was a rather wide and vague signification, though it soon began to be divided into different countries. Some fifty years before Thevenot published his Relations, Tartary was supposed to include about the same as Scythia, famous ever since Ptolemy's map. The ambassador of Philip III of Spain, DON GARCÍAS DE SILVA FIGUEROA, who in 1617 came to Shah Abbas the Great, wrote for instance: Il n'y a personne qui puisse douter, que cette Nation vagabonde de Turcomans ne soit sortie de la Scytie ou Tartarie Asiatique.²

I have already had occasion to quote the most important passages from Father KIRCHER, and it is chiefly for the continuity of this historical account that we have to return to him once more.³ Speaking of Goës he draws the following conclusion regarding the roads from Lahor towards the north.

Nota tamen hoc iter ex Laor versus Boream longius protractum, cum ex Laor per multò compendiosiore viam, terminum suum attingere potuisset; Verùm uti hoc per Thebeticos montes iter nondum detectum erat, ita quoque illud in Usbec & Samercandam tunc temporis usitatus, etsi per ingentes ambages devium & vias undique & undique latrocinii infame, negotiatorum consuetudini se accomodans tentare coactus fuit.⁴

He means to say that GOËS took a quite unnecessary roundabout way to the west, and that it would have been a shortcut had he travelled from Lahore northwards across the Tibetan mountains, by which name he signifies Himalaya. But the latter road was unknown in Goës' time, and was discovered later on by Andrade. This was the cause why the road of Usbeck and Samarkand was more

¹ Troisième Partie des *Voyages de M. de Thevenot*. Paris MDCLXXXIV, p. 170.

² *L'Ambassade de D. Garcias de Silva Figueroa en Perse . . . traduite de l'Espagnol par Monsieur De Wicqfort*. Paris MDCLXVII, p. 100.

³ Cf. Vol. I, p. 166 et seq. and Vol. III, p. 4 et seq.

⁴ *China . . . illustrata*, Amst. CIOCLXVII, p. 64.a.

frequented then, though longer, more difficult and dangerous. As to the countries bordering upon the empire of Great Mogol to the north and east, Kircher says: à Borea Usbec, Tebeticis montibus & Regnis Srinagar, Caparangue, Radoc, ab Ortu Necbal Regno terminatur.¹ This may be said to be nearly correct, though he could not know how the kingdoms mentioned were situated in relation to one another. As to Chaparangue or Tsaparang, the geographers of the time could not make out its situation and sometimes believed that Andrade had meant Lhasa. A hundred years later GEORGI, who used the observations of DE LA PENNA had a more correct conception of the general situation.

Kircher has made a curious mistake regarding MARCO POLO'S Belor, which he, on his map, places between Tanchut Regn. and Regn. Tibet, and suggests may be the same as GRUEBER'S Langur. He says:

Vocaturque haec Regio Belor, omni tempore hyemis effigiem praeseferens, donec viator 40 dietas absolvat, Haec Marcus Venetus. Quae omnia monti illi, quem hodiè Langur vocant, omnium altissimo in Lasa Regno existenti conveniunt; de quo P. Joannes Gruberus, quem & pedestri itinere dimensus est, refert summitatem ejus aestivo tempore pertransire, periculo non carere, tum ob aëris maximam subtilitatem, quae vix viatores respirare permittit, tum etiam ob venenosae herbae cujusdam evaporationem, quae halitu suo, & homines & jumenta enecat. Atque circa hoc Regnum Belor, antiquam scilicet Sacarum stationem, Thebeth principale Presbyteri Joannis in Cathaio Regnum situm esse R. Pizol cum Veneto id Belor vocat, in quo & Regnum Thebeth recens detectum ait²

In this desperate attempt to identify Marco Polo's Belor with Grueber's Langur, and the recently discovered Kingdom of Tibet, Kircher's text does not quite agree with his map.³

Athanasius Kircher seems to be responsible for the mistake about ANDRADE'S itinerary, which by some scholars even in our own days, has been accepted without reserve. He relates the chief stations on Andrade's route in the following few words:

Iter verò quod P. Antonius Andrada Lusitanus in Regnum Thebet aggressus fuit, tale est: Ex Lahor Gangem trajiciens primò in Scrinegar & Ciapharangam urbes ingentes populosissimasque, ex hisce per altissimum montem transgressus in summitate ejus ingentem lacum, commune Indi, Gangis caeterorumque Indiae majorum fluminum hydrophylacium detectum observavit; & hinc multorum dierum itinere per altos pariter montes in Redoc frigidissimam Regionem Borealem, ejusdemque nominis urbem pervenit; ex qua per Regnum Maranga & Tanchuticum Tartarorum Regnum bimestri spatio facillè Cataium, id est, China attingi potest.

The chief points are that Andrade travelled to Tibet, that he, leaving the towns of Srinagar and Tsaparang, crossed the extremely high mountains, on the top of which he found the large lake from which the great Indian rivers take their origin. Leaving this lake he had a journey of several days, crossing mountains of

¹ Op. cit., p. 79 b.

² Op. cit., p. 48 b.

³ Reproduced as Pl. XI in Vol. I.

the same height, which took him to the very cold region and town of Rudok in the north. Travelling from Rudok by the kingdoms of Maranga and Tanchut, belonging to Tartary, he had a comfortable journey of two months to Cathay or China.

The great mistake of Kircher is that this beautiful journey was never accomplished by Andrade. As far as we know with certainty, he never proceeded beyond Tsaparang. But if he had done it, as Kircher supposes, he should no doubt have had to cross mountains of very considerable height, though not as high as the first ones which were the Himalaya. Finally, the distance from Rudok to China could hardly have been covered in two months.

It may be of interest to quote what a few geographers, contemporary of Kircher or living shortly after his time, have to say of the countries north of India. The Jesuit, CORNELIUS HAZART, just mentions the journey undertaken by Dorville and two German Fathers with the object of finding a road overland from Europe to China. So far as is known, Dorville had, however, only one German Father as a fellow traveller, *viz.* Grueber. Hazart says:

... Wy hebben over twee jaeren onbegrepen verstaen, dat P. Albertus Dorville gheboren van Brussel uyt Sina ghekomen sijnde te Agra door eenen langhen, ende moeyelijcken wegh, met twee Duytsche Paters, om eenen wegh te vinden, door den welcken men te lande van Europa soude kunnen gheraeken in Sina, aldaer was ghestorven, in het bywesen van vele in-ghesetene Christenen, die groote droefheydt bedreven over sijn doot, ter oorsaeke van sijne besondere deughden, ende opinie van heyligheydt.¹

This was written the same year as Kircher's work was published, containing more details on the journey of GRUEBER and DORVILLE. A year later, or 1668, JOAN NIEVHOFF gives the frontiers of the Chinese empire thus: Inter Regna magis borealia Samahan & Kascar desertum arenosum Samo jacet. Austrum regna Presbyteri Johannis, Geo, Tibet, Laos & Mien, à Sinis Sifan, id est Regni confinia dicta, claudunt. Inde Bengala proximat & Damasios montes, per quos à Tartaris & Indis secernitur.²

The Damasian Mountains are here regarded as a boundary between China and Tartaria-India, which would give them a tremendous extension. Regarding the source of the Yellow River, Nievhoff has the following information to give:

Oritur in regno Tibet & Laos, ex montibus Quenlun, unde etiam Ganges, fontes plures quam centum habet, cujus aquae supra lacum Singcieu aestuant? Ortus Hoang fluvii est inter australes montes Quenlun, quos incolae Otunlao vocitant. Aquae pluribus quam centum fontibus scaturientes, ad superficies lacus, quem efformant, ebulliunt. Singcieu mare dicitur: octoginta stadia quadrata occupat: ex eo aqua, canali deducta, alterum lacum efficit, antecedenti paulo minorem.³

¹ *Kerskelycke Historie van de gheheele Wereldt, etc.* Deel I, t'Antwerpen, M.DC.LXVII, p. 277.

² *Legatio Batavica ad Magnum Tartariae Chamum Sungteium, Modernum Sinæ Imperatorem, etc.* Amstelodami CDDCLXVIII, p. 5.

³ *Op. cit.*, Pars Ultima, p. 71.

He regards both the Yellow River and Ganges as coming from the Kwen-lun Mountains, called Otunlao (Odontala?) by the natives. His authority is, of course, Thevenot and Martin Martinus.

In 1676 Father TOSI has a short report to give regarding the mountains north of India. According to him the Mountains of Naugracot give rise to the Indus, whilst the Ganges is believed to come from the Scythian Mountains situated far to the north. He also speaks of Kashmir and its surrounding snow-covered mountains. He has, however, nothing important to say beyond the information given by other geographers, whose narratives have been quoted in Vol. I. The following extracts may still be of some interest.

Nasce l'Indo dalle montagne di Naugracot Non hà cosi certa la sua scaturigine il Gange, mentre alcuni dalle stesse montagne di Naugracot gli danno la mossa, & altri riconoscendo da più rimoto clima il principio vogliono, che nasca da i monti della Scithia, e che passando per l'angustie d'alcune montagne, che di lontano fanno sembianza con le sommità loro del capo d'vna Vacca, adorati perciò da quei superstiziosi Gentili con molta veneratione, sgorga quasi dalla bocca di quell'animale in vn ampio stagno E voltandosi à man destra verso l'Oriente s'entra nel Regno di Cassimere, paese il più delizioso, e più ameno di tutto l'Indostan, essendo per ogni parte inassiato da freschissime acque di sorgenti, di ruscelli, e di laghi. E alquanto freddo per la vicinanza delle montagne ricoperte di neue

Of Regno di Siba, which we have found on so many maps from the 17th century, and of its vicinity to the Dalanguer Mountains, he says: La sua Metropoli è Serenegar vicina à i Monti Dalanguer, à quali sempre biancheggia il crine di neue; onde la prouincia è freddosissima, ancorche non habbia più die 40 gradi di latitudine.¹

ARNOLDUS MONTANUS tells us that north of Kashmir are the Mountains of Caucasus, so he still in about 1680, uses the classical name, and has, of course, no more than anybody else, ever heard the name Kara-korum. Giving the boundaries of Mogul's Empire, he says that to the north are the Tibeth Mountains and Tsaparang. He has also heard of the high Mountains of Belor and Pamir and of the royal cities of Samarkand and Bokhara: Wat belangt Mogols rijk, leid besloten westwaerd met de rievier Indus, ten oosten met de Ganges: stoot zuidelijk tegen d'Oceaan en't landschap Visiapour: noordelijk leggen de gewesten Usbek, Srinagar, Kaparangue, Radok en't gebergt Tibeth, Balassan, aen de Tattars geraect, verthoont d'hooge bergen Bellor en Pamer, en de koninglijke steden Semergian en Boka, alwaer byzonder de Sineesen sterke handel drijven. Kaximir, anders ook Kascimir, vermaekelijkste rijk des aerdbodems, stoot noordwaerd tegen't gebergte Kaukasus.²

¹ *L'India Orientale Descrittione Geografica, & Historica. Doue si tratta della Parte intra Gangem contenente li Regni soggetti all Impero del Gran Mogol* Del. P. Abbote D. Clemente Tosi, Roma 1676, p. 6, 26 and 43.

² *Oud en Nieuw Oost-Indien door Arnoldus Montanus.* Amsterdam (Dedication dated 1680), p. 12, 440, 456 and 457.

In the following words N. SANSON D'ABBEVILLE gives an interesting description of Turkestan and Tibet, as these countries were known in, I believe, 1683.

Le Turquestan est à l'Orient de l'Usbeck, ou Zagathay, à l'Occident du Cathay, au Septentrion de l'Inde, & au Midy de la vraye Tartarie. Il se subdivise en quelques Royaumes, dont les plus connus sont Cascar, Cotan, Cialis, Ciarchian, Thibet, &c. une partie de leurs Villes Capitales étans de même nom. Quelques-uns toutesfois nomment Hiarchan, au lieu de Cascar & Turon, ou Turphon, au lieu de Cialis, pour Chefs de ces Royaumes. Celuy de Cascar est le plus riche, le plus fertile, le mieux cultivé de tous, celuy de Ciarciam est estimé de moindre, & tout Sablonneux; ayant en recompense force Jaspes & Cassidoines: mais celuy de Cascar a aussi de la Rheubarbe excellente, & en quantité. Ceux de Cotan, & du Cialis ont du Bled, du Vin, du Lin, de la Chanvre, du Coton, &c. Thibet est le plus avancé vers les Mogols de l'Inde, & le plus engagé dans les Montagnes d'Imave, du Caucase & d'Ussonte. Il y a force animaux sauvages, du Musc, de la Canelle; & se servent de Corail au lieu de monnoye. Les Relations qui en avoient été données en 1624, & 1626, nous avoient fait cet Estat si grand, & si riche, qu'ils le vouloient confondre avec le Cathay: mais celles de 1651, en font la Region tres-froide, & toujours couverte de Neiges; estiment son Roy tout Barbare, & moins puissant que celuy de Serenegar, qui n'est qu'un Rahia entre les Estats du Grand Mogol: tant il y a peu d'assurance à la plupart de ces Relations.¹

The map of Tartary of which Pl. IV is a reproduction, has a strong resemblance to Sanson's map of 1654 (Pl. XXX in Vol. IV). His map, *L'Empire du Grand Mogol*, in the same book, also resembles Pl. XXIX in Vol. I.

A few years later NICOLAES WITSEN says that the Desert of Lop is situated west of the Great Wall and begins at 37° North. Lat. at the Mountain of Imaus, where the town Xacheu or Sachion is located. From the narratives of the missionaries, he got the impression that volcanoes existed in Southern Tibet. The well-known Langur, he calls Kangur, which may be a misprint: »Onder de Bergen zyn 'er twee die in hoogte uitmunten, de Kangur en de Cumbala, waar van de eerste eene Zwaare en vergiftigde Lucht geeft, die uit Zwavelagtige dampen gebooren word, en dus een teeken van en Vuurspuwenden Berg heeft.»²

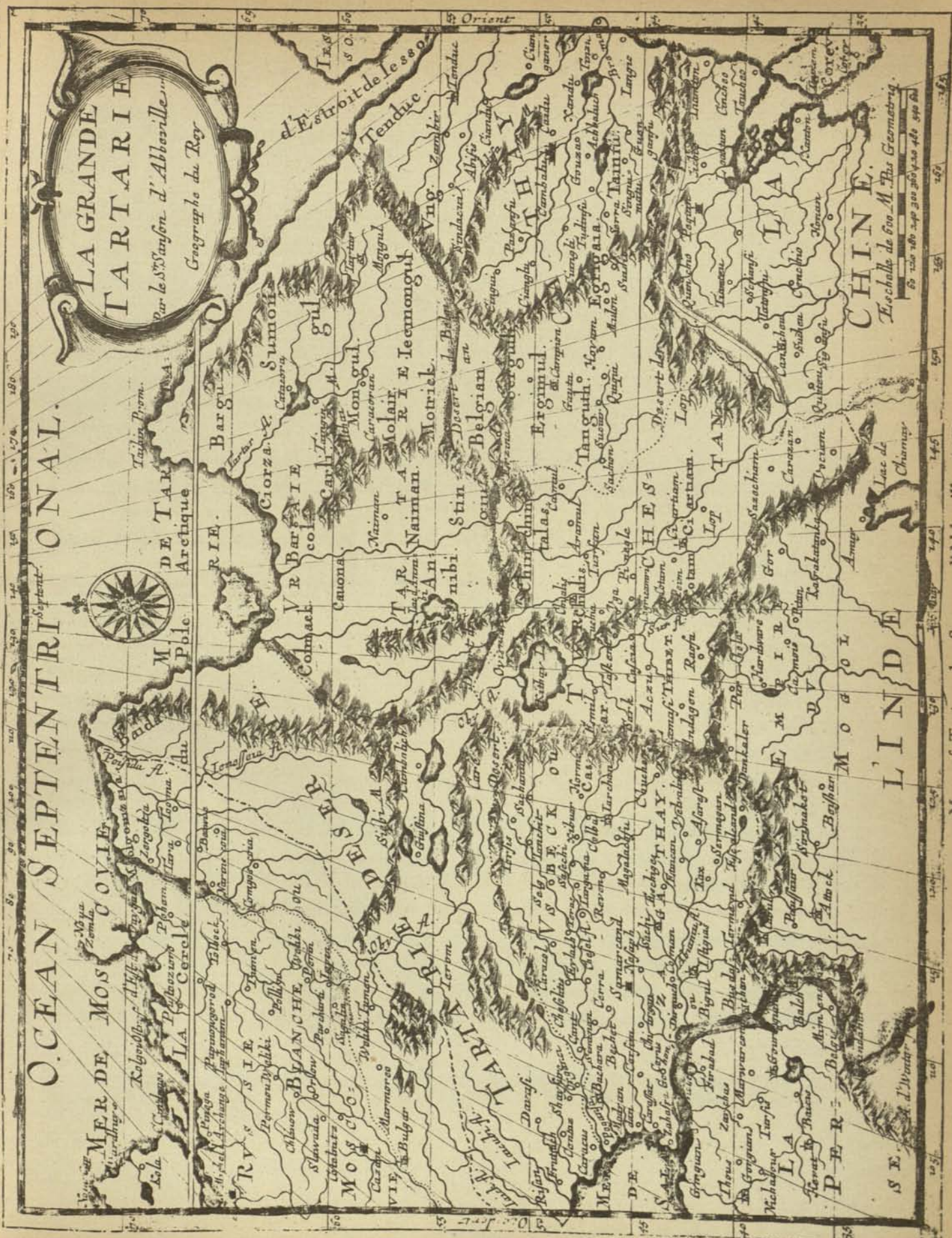
The original French edition of Father AVRIL'S work is not at my disposal. The following quotation may, therefore, be inserted from the English translation, proving that he has an approximately correct idea of the general situation of Central Asia and Tibet. Speaking of the »Calmoucs» he says:

They are all Idolaters, as well as the Mongulls, and all the rest of the Nations of Great Tartary as far as the Indians; and every one of these Pagan Nations acknowledge for the Head of their Religion the Dalaè-Lama, or Lama-lamalow, except those of Bokara and Samarkand, who make Profession of Mahometism.

This Impostor has his Residence in the Kingdom of Sanshut, which extends from the Mongulls, the Calmoucs, and Turquestan, between China and Persia to the Indies.

¹ *L'Asie en plusieurs cartes nouvelles et exactes; et en divers traittés de geographie & d'histoire.* Par le S. Sanson d'Abbeville, Geographe Ordin. du Roy. Paris MDCLXXXIII, p. 77.

² *Noord en Oost Tartaryen, etc.* Amsterdam 1785, p. XXII and 265. The first edition published in 1692.



Map of Tartary by Sanson d'Abbeville, 1683.

The Capital of his Territories is the City of Barantola, where there is a Temporal Prince also call'd Deva; but the Dalaë lives in a Fortress call'd Beatalaë, that stands very near the same City. 'Tis not to be imagin'd how he is, in a manner, worshipp'd over all Tartary.¹

Before continuing our account we have to consider a few important maps of the 17th century so far as their representation of the high mountains is concerned.

HONDIUS, 1611, has Imaus mons as a principal range from west to east with several ramifications. HOEIUS, about 1640, on the other hand, has nearly no latitudinal Imaus; only in the midst of a net of irregular and fantastic ranges, he has a meridional Imaus. IANSSONIUS, on his map of 1641, confounds the orography more than ever. A great improvement is shown by the map of SANSON D'ABBEVILLE 1654, where both Cassimere (Kashmir), Rahia Tibbon (Ladak) and Thibet are entered, and the great northern water-parting of the Indus and the Ganges is called Mont de Caucase. South of the latter are other ranges, as Dalanguer Mont and Dow Lager M. Here we are nearer to the Kara-korum than ever before, though, of course, there is no knowledge yet of its existence. On the same cartographer's map, *Description de la Tartarie*, we find, N. W. of the source of the Ganges, between two ranges, Tibret forsan et Tobrot, i. e. Ladak.

KIRCHER'S map in his *China illustrata* 1667, gives a most curious representation of the mountains north of India. There are the Montes Tebetici culminating in a tremendous mountain in the west, where the Origo Gangi et Indi is to be found; to its north and east are Tibet Reg. and Regn. Cascar and Radoc, but to its south, Caparangue, i. e. Tsaprang. Between Reg. Tibet and Tanchut Regn. it has Belor mons and Consanguis mons lapideus. Benedict Goës' route is here represented as situated south of Caucasus mons.

On NICOLAUS VISSCHER'S map, about 1680, we again find, in the east, Consagni Mons Lapidus and Belor Mons; to the south, Montes Tibetici and Serenager Montes, the latter between Tibet Minor (Baltistan) and Indostan. In Tibet Minor we have Eskerdow or Skardu, but at this place, which indeed belongs to the Kara-korum, there are no mountains at all. Just where the Kara-korum is situated, or between his Eskerdow to the south, and Kachger, Iourkend and Kaskar Regnum to the north, he represents the country as a plain.

CANTELLI'S map of 1683 is of interest as he makes an attempt to represent the geography of Goës. His Monte Caucaso, corresponding to the Himalaya, with Tibet and Boutan to the north, continues to the east and north in a meridional range which he calls Sacritma M. and which forms a partition wall between Tibet

¹ *Travels into divers Parts of Europe and Asia, undertaken by the French King's Order to discover a new Way by Land into China.* By Father Avril, of the Order of the Jesuits. Done out of French. London. MDCXCIII, p. 152.

and Mawaralnara. West of the range Sacritma is the country Sarcil with the places; Sarcil, Serpanil, Ciaciunor, Chaman and other names taken from Goës, whilst his Iaconich is east of the same range. Between Raia Tibbon and the southern end of Sacritma M., he has a continuous range.

NICOLAES WITSEN, 1687, has tried to bring Goës into harmony with earlier notions. East of the Upper Ganges we find *Caucasi montes* and, north of them, *Consanguimons lapideus*. N. W. of the latter, is *Gecialath mons* from which one of the feeders of the Ganges takes its rise. At the source of the western-most feeder, is *Chaparangute*, and west of it a mighty range of mountains, partly called *Tápúli montes*. South of the latter, is *Iaconich*, and south of this, *Cascar* and *Egriar*.

From the middle of the 17th century, is DE WITT'S map showing, to the north of Cassimere, *Rahia Tibbon*, the latter being separated from the sources of the *Amu-daria* by a range which continues far to the N. N. E., and is placed east of *Iaconich*, *Cascar* and *Egriar* and south of *Thibeti Reg.*

CORONELLI, 1695, enters the mountains on his map in the form of dotted lines, the one north of India being *Monti Cocas*, or *Caucasus* and having to its north, *Thibet*, *Vachun* and *Turquestan*. North of *Thibet* is a nameless range, being the southern boundary of *Regno di Cascar*, where *Iaconich* is found S. S. W. of the town, *Cascar*.

CHAPTER VII.

FRANÇOIS BERNIER.

The famous French traveller, FRANÇOIS BERNIER, was born in Anjou in 1620. In 1659 he visited Surat and Agra, in 1663, Delhi, in 1664, Kashmir. After a visit to Lahore he travelled, in 1665, with TAVERNIER to Bengal, and west to Golkonda the next year. In 1667 he met CHARDIN at Surat. In 1669 he returned to Marseilles, and published his book the next year. He died at Paris 1688.

In the first volume of his work¹ he only mentions »le grand Tibet» as a hopeless country, full of mountainous deserts. And he tells his readers that the horses called »Turki» come from Turkistan or Tartary.

In his second volume he gives us more information and has even something to say of the caravan-road over the Kara-korum. Bernier accompanied Aureng-Zebe on his journey to Kashmir. During his stay in that country he got some news about the mountainous country all around. Some merchants told him that between »the other mountains, situated further away and independent of Kachemire», there are to be found very agreeable places, inhabited by white and well built people, who almost never leave their country, and that there are amongst them, peoples who have no kings at all and even no trace of religion, so far as can be made out, and if the fact should not be regarded as being of a religious character, that they never eat fish, believing it to be impure.

Bernier saw the king of little Tibet, the neighbour of Kashmir, who came to pay his respects to Aureng-Zebe, and whom he describes as a rather poor »Roitelet».²

J'entendois qu'il disoit que son Pays de costé de l'Orient confine avec le grand Tibet; qu'il pouvoit avoir trente ou quarante lieues de large; que veritablement il avoit quelque peu de crystal, quelque peu de musc & de laines, mais que du reste il estoit fort pauvre, & qu'il n'y avoit point de mines d'or comme l'on disoit; qu'il y avoit en certains

¹ *Voyages de François Bernier, Docteur en Médecine de la Faculté de Montpellier, Contenant la Description des Etats du Grand Mogol de l'Hindoustan, du Royaume de Kachemire, etc.* Amsterdam 1699. Tome premier, p. 145.

² Tome second, op. cit., p. 306 et seq.

endroits de fort bons fruits & sur tout d'excellens melons; que l'Hyver y estoit extremement grand & facheux à cause des neiges, & que le peuple, qui par le passé estoit Gentil, s'estoit fait presque tout Mahumetan comme lui, à sçavoir de cette secte qu'on appelle Chia, qui est celle de toute la Perse.

He also tells us that the king of Great Tibet, when he had heard that Aureng-Zebe was in Kashmir, sent an ambassador to him with presents. — Cet Ambassadeur avoit amené avec soi un Medecin qu'on disoit estre du Royaume de Lassa & de Tribu Lamy, ou Lama, qui est la Tribu des gens de Loy de ce pays-là comme est celle des Brahmens dans les Indes, avec cette difference que les Brahmens des Indes n'ont point de Califi ou Pontife, & que ceux-là en ont un que non seulement le Royaume de Lassa reconnoist pour tel, mais encore toute la Tartarie & qui est honoré & respecté comme quelque chose de Divin.

Bernier did his best to get information from this ambassador, about the mountains to the north and east. But he regrets having been unable to get very much out of him. The ambassador only told him that the kingdom of Great Tibet was a miserable country, full of snow during more than five months every year, and that its king often was at war with the Tartars: mais il ne me pût jamais distinguer quels Tartares c'estoit.

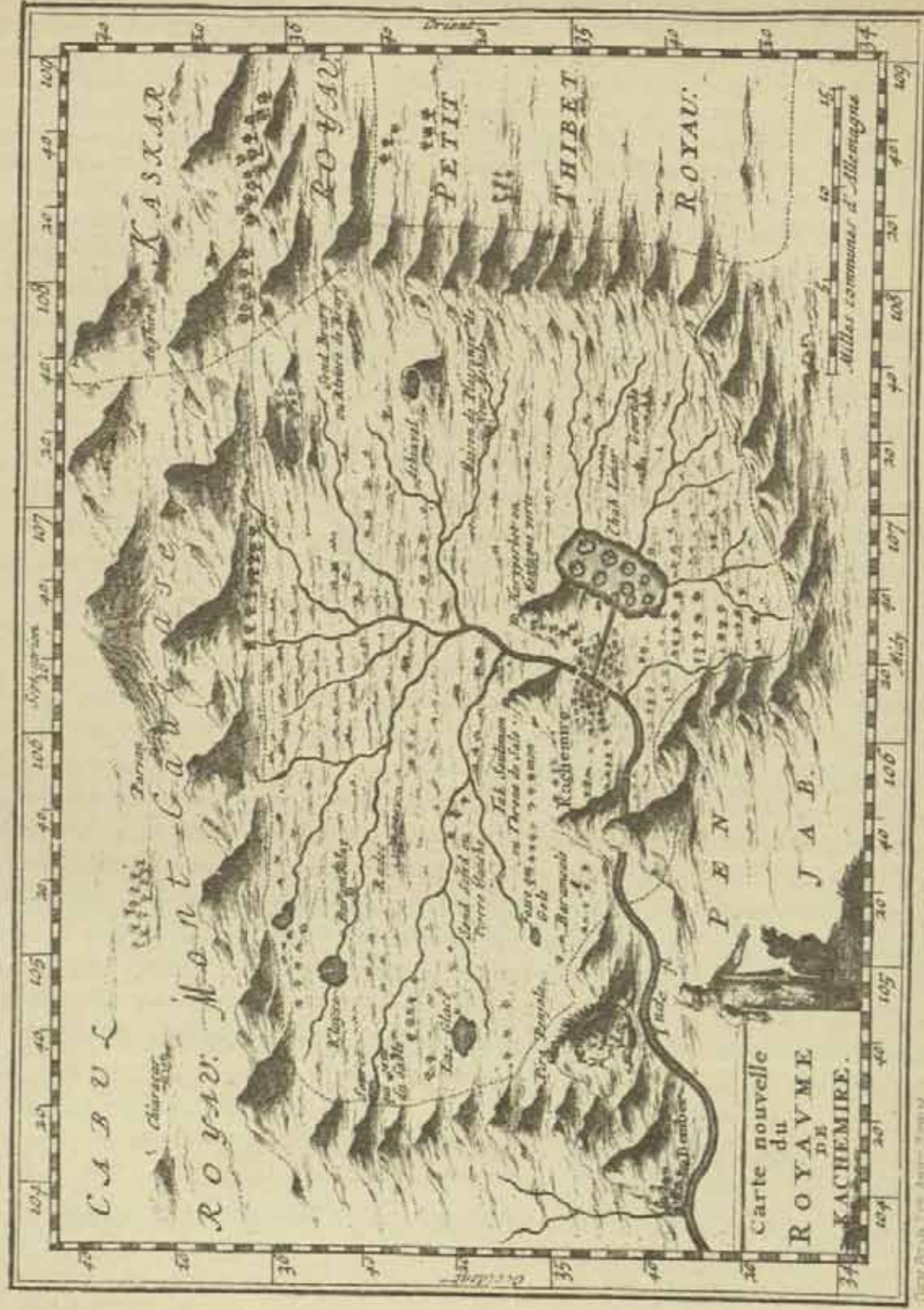
Of the trade route, he got the following news:

Voicy une autre chose qui est si constante que personne n'en doute icy; il n'y a pas encore vingt ans qu'il partoît tous les ans de Kachemire des Caravanes qui traversoient toutes ces Montagnes du grand Tibet, entroient dans la Tartarie, & se rendoient en trois mois ou environ à Catay, quoy qu'il y ait de tres-mauvais passages & des torrens tres-rapides qu'on passe sur des cordes qui sont tendues d'un Rocher à un autre; ces Caravanes raportoient du musc, du bois de Chine, de la Rhubarbe & du Mamiron qui est une petite racine tres-bonne pour le mal des yeux; en repassant par le grand Tibet elles se chargeoient aussi des marchandises du Pays, de musc, de crystal & de Jachen . . . mais depuis cette entreprise que fit Chah-Jehan de ce costé-là, le Roy du grand Tibet a entierement fermé le chemin, & ne permet que personne du costé de Kachemire entre dans son Pays; & c'est pour cela que les caravanes partent à present de Patna sur le Gange pour ne passer point par dessus ses terres, les laissant à la gauche, & gagnant droit le Royaume de Lassa.

In those days it seems to have been easier to travel through Lassa than through Ladak.

About the route to Kashgar, the following is what he heard:

Ils disent que le Royaume de Kacheguer est à l'Orient de Kachemire tirant un peu au septentrion; que le plus court chemin seroit d'aller droit au grand Tibet, mais que le passage estant fermé, ils étoient obligez de prendre par le petit Tibet; que premierement ils s'en alloient à une petite Ville qui s'appelle Gourtiche, qui est la dernière Ville dépendante de Kachemire, & à quatre journées de la Ville de Kachemire, que de là en huit jours de chemin ils alloient à Eskerdou, qui est la Ville Capitale du Roy de petit Tibet, & de là en deux jours à une petite Ville nommée Cheker, qui est encore du petit Tibet, & qui est située sur une rivière fameuse pour estre fort medicinale; qu'en quinze jours ils passoient à une grande forest qui est sur les confins du petit Tibet, & en quinze autres



Kashmir as represented in Bernier's narrative, 1670.

jours à Kacheguer petite Ville, qui a esté autrefois la demeure du Roy de Kacheguer, au lieu que c'est à present Jourcend qui est un peu plus vers le Septentrion, & a dix journées de Kacheguer. Ils ajoûtoient que de la Ville de Kacheguer à Katay il n'y a pas plus de deux mois de chemin; qu'il y va tous les ans de Caravanes qui raportent de toutes les sortes de marchandises que j'ai dit, & qui passent en Perse par l'Usbek, comme il y en a d'autres qui de Katay passent à Patna dans l'Hindoustan. Ils ajoûtoient encore que de Kacheguer pour aller à Katay, il falloit gagner une Ville qui est à huit journées de Coten, qui est la dernière Ville du Royaume de Kacheguer; que les chemins de Kachemire à Kacheguer sont fort difficiles; qu'il y a entre-autres un endroit où dans quelque temps que ce soit il faut marcher environ un quart de lieue sur la glace.

He adds that this is all he could get out of the ignorant people. The route in question seems to have gone over Skardo and Shigar before it turned to the east, probably across the Kara-korum Pass. The »grande forest» may possibly be Chong-jangal, which means »great forest». Fifteen days to Kashgar, may simply be Karghalik or any other place in the kingdom of Kashgar. Bernier has obviously misunderstood his informants, as he places Yarkand north of Kashgar. The place between Kashmir and Kashgar, where one had to pass for a quarter of a lieue on ice, may be Saser-davan or the Kumdan Glaciers. The description is too meagre to let us draw any reliable conclusions, and I am perfectly aware that it also covers Younghusband's western road over the Mus-tag Pass, which is reported to have been easier to cross in olden days.

Still the narrative of Bernier is of great interest as being the first reliable information regarding the road across the Kara-korum Mountains. Although his journey to Kashmir was accomplished nearly a hundred years after MONSERRATE'S, his results cannot be compared with those of the latter. Monserrate is a more intelligent observer, and he has even been able to represent the N. W. Himalaya on a very good map. On the other hand, Bernier did his very best, by means of native information, to penetrate the mysterious mountain country to the north-east.

His map of the rivers of northern India is less correct than the one of Ptolemy, although, of course, he has many names easy to recognize. He calls the Himalaya, Caucase M. and directly north of this range of mountains, he has Zagathay, Tartarie and Turquestan, the last-mentioned far to the east; but there is no trace of Tibet at all. The whole highland between the Himalayas and the Kwen-lun is represented by only one single mountain range, which is the same view as in the case of PTOLEMY and STRAHLENBERG.¹

But on a small map,² *Carte Nouvelle du Royaume de Kachemire*, Pl. V, Bernier has, due east of Kashmir, »Petit Thibet Royau,» and to the N. E., »Kaskar Royau,». Kashmir is represented as a valley, surrounded on all sides by mountains,

¹ Bernier's maps in the edition of 1699 are the same as the ones first published in 1670.

² Op. cit., p. 268.

those to the north much bigger than the rest, and called Mont Caucase. In the middle of the valley is the Indus, collecting its tributaries from all surrounding mountains. The main branch of the Indus comes from Mont Caucase, and the Upper Indus does not get any tributaries from any country outside of Kashmir.

Bernier's two maps are very unlike one another. On the first, Pl. VI, we find Kakares and Naugracut as two provinces east of Kashmir, and he makes the river, which on the second map is called Inde fl., on the first to a tributary of the Send, and makes both join at Attock. The verbal information, as given in the text, is much better and can easily be followed on modern maps, but it is no wonder that Bernier himself found the information he got somewhat confusing. Still the information brought back by him was of a certain importance. The road across the mountains he heard of, was entered on VISSCHER'S map of about 1680¹, with all the names found in Bernier's book. From Visscher, they were adopted on many later maps.²

NICCOLAS MANUCCI,³ on the other hand, had no high opinion of the French traveller, which, however, seems to be chiefly due to *jalousie de métier*. He says of Bernier:

I leave it to the reader's curiosity to read what Monsieur Bernier has written about that journey, although, if I am to speak the truth, he puts many things of his own into his Mogul history and I could, through his chronology of the times, make it clear that he writes many things which did not occur — nor could they have occurred — in the way that he relates them. Nor could he have been too well informed, for he did not live more than eight years at the Mogul court; it is so very large that there are an infinity of things to observe. Nor could he so observe, for he had no entrance to the court. As it seems to me, he relied for what he said upon the common people; and if there is any good thing in his books, it is due to the information given him by Père Buzeo, also to what I gave him, having then no intention of writing anything.⁴

To this IRVINE remarks: »N. M.'s own chronology being persistently two years in arrear of the true dates, it is amusing to find this serious reproof of Bernier's inaccuracy.»

The great work of Manucci is, otherwise, rather poor in geographical information of interest to us. His description of Kashmir runs thus:⁵

On the confines of Kashmir is the province of Tibet, which belongs to China, divided from Kashmir by extremely high hills and chains of mountains. These are so steep that it is impossible to climb over or descend from them. But Nature taught a way of establishing friendship between the peoples, even though divided by such lofty walls.

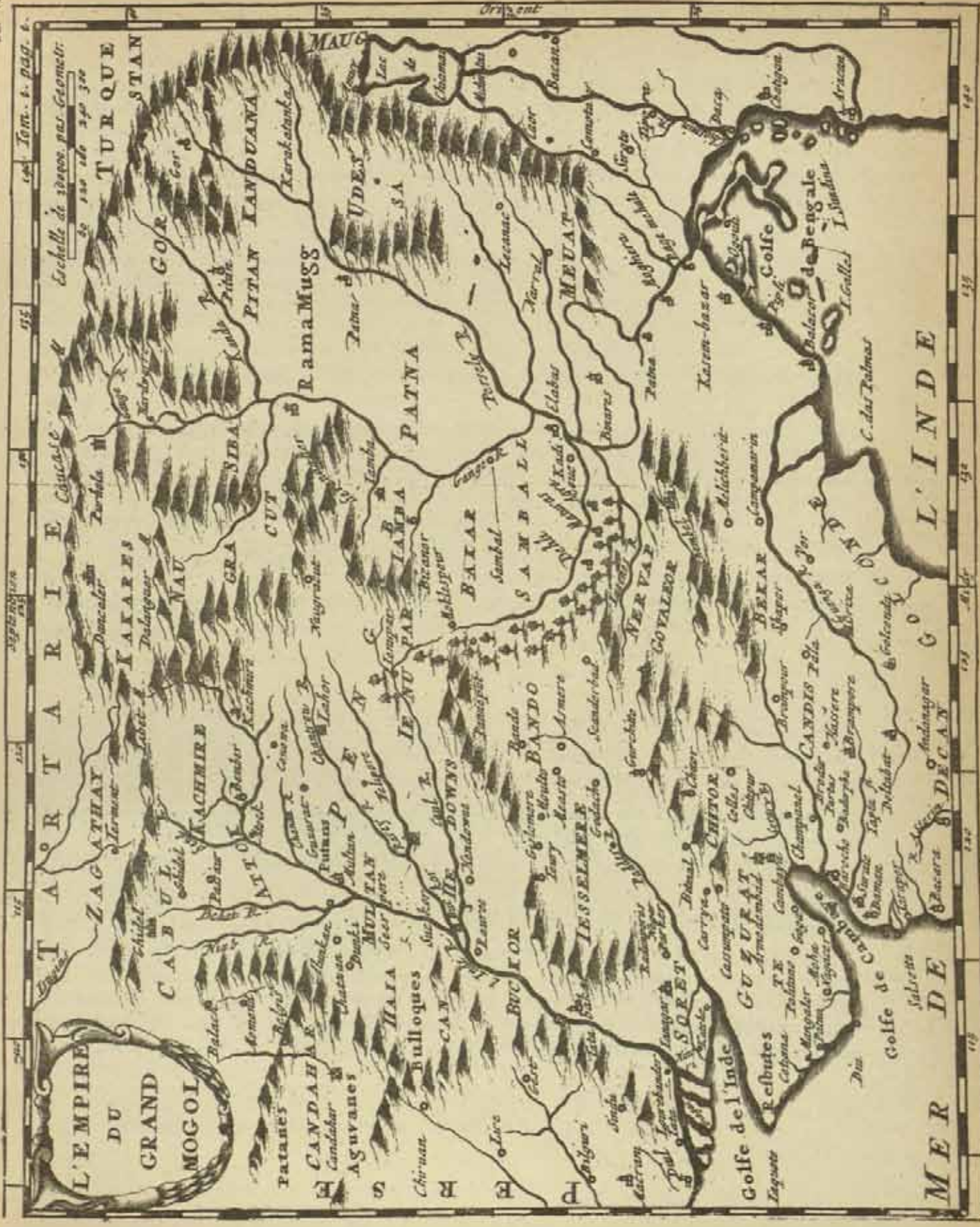
¹ Vol. I, Pl. XXXII.

² Cf. Vol. I, p. 197, 198.

³ His name usually appears in the French spelling: Manouchi, cp. Vol. I, p. 72, n., p. 224.

⁴ *Storia de Mogor or Mogul India 1653—1708* by Niccolao Manucci, Venetian, translated by William Irvine, Vol. II, London 1907, p. 75.

⁵ Op. cit., II, p. 235.



The Empire of Great Mogul as represented in Bernier's narrative, 1670.

For the inhabitants carry out their intercourse with great fairness, those of the province of Tibet placing rope ladders for the descent, and when the business is over they remove these ladders. If they have no ladders, they let down their merchandise in a basket, and then carry on a conversation from the heights. In this way they conclude their bargains.

By Tibet he means Ladak. He has heard of the existence of the very high mountains between Kashmir and Ladak, though the story of the rope ladders belongs to other parts of the mountains. What else he knew of Tibet is very meagre:

The mountains begin in Pegū and are found as far as Kashmīr, and thence to the river Indus, to Kābul, Balkh, and Tartary. The inhabitants of these mountains are of an almost white complexion, eyes and nose small, and their speech is different from that of the Mogul country and very similar to Chinese. — In these mountain ranges, twentyfour days' journey from the city of Patnah, is an absolute king called Botand (?Bhutān). He has in his territories much gold, perfect musk, rubies, and precious stones.

After having dwelt a little on the curious customs of the Tibetans, he goes on to say:

It is through this country that lies the route to China, but it is a very long way, and the roads most hazardous from the great mountains and many rivers. I state this on information given me by some Armenians and others who had been there, including two Jesuits, who came from China by this road. One was a Fleming and the other a German, with whom I had many a talk about this country.¹

His Botand is the same as MONSERRATE'S Both or Bothant, and has in this connection to be regarded as western Tibet proper. That he here really meant Tibet, appears from the fact that he has got some of his information from Grueber and Dorville who arrived at Agra in 1662.

* * *

In the *Mercur de France* for July 1718, the narrative of a traveller in Tibet is published, probably a missionary who seems to have travelled in 1706, or at least to have gathered his information about this time. His information was republished a hundred years later under the title *Nouvelle description du royaume de Boutan, faite par un voyageur qui y a demeuré fort longtemps*.² By Boutan he obviously means Southern or proper Tibet. He is supposed to be authentic, though several of his statements are somewhat curious. The author, whosoever he may be, has at least got a very strong impression of the high barren and snow-covered mountains and of the desolate inhospitable alpine nature of Boutan. He says:

Le royaume de Boutan est situé dans l'Asie: à l'orient, il confine avec la Chine; à l'occident avec l'Indoustan, c'est-à-dire avec les royaumes de Niépāl ou de Nercerri; au septentrion, avec les royaumes de Foukten et des Kalmouks, dans la Tartarie; et au midi, avec le Mogul, ou même comme le prétendent quelques-uns, avec le royaume de

¹ Op. cit., p. 439, 440.

² *Nouvelles annales des voyages*, Tome IV, Paris 1820, p. 291 et seq.

Siam le royaume de Boutan est composé de plusieurs provinces, gouvernées par des princes particuliers et absolus dans leurs états. Leurs sujets leur donnent le titre de rois; mais le souverain de tout le pays, qui demeure à Lassa, capitale de tout le Boutan, ne leur donne que celui de déba ou de gouverneur Autant que je le puis connoître, ce royaume a de longueur environ trois mois de chemin d'un homme de pied, et quarante jours de largeur. Le pays est tout rempli de montagnes; ce qui fait que le froid y est très-vif, quoiqu'on y soit assez près de la ligne, puisque Lassa, capitale de tout le royaume, n'est qu'au 30me degré de latitude boréale, et par conséquent peu éloignée du tropique. Les montagnes sont, la plus grande partie de l'année, couvertes de neiges, et presque partout entièrement stériles en sorte qu'elles sont inhabitées, non seulement par les hommes, mais encore par les bêtes sauvages.

Thus the unknown author of these lines only in general states the existence of mountains, and has, of course, no idea of the ranges or systems situated north of the Himalaya. To the cartographers of the epoch, the Kara-korum System is likewise hidden in impenetrable clouds. ISBRANTS IDES, for instance, in 1704, has made the orography as simple as possible, joining Ispahan with Kabul by a mighty range, placing its eastern end and Kabul at the source of the Ganges. DELISLE, 1705, has the Himalaya under the name of M. de Purbet ou de Naugracut, stretching N. W. between Royaume du Grand Tibet and Pengab to Petit Tibet, in the neighbourhood of which several of GOËS' names are entered, as Sacritma M., and, to the N. E., M. Ciecialith and Tanghetar. About the same representation is given on the same draftsman's map, *Carte de Tartarie* of 1706, where Tibet is situated between two ranges as it is in reality. To the north of the northern one are Cachgar and Cotan, and east of the latter the old meridional Imaus. On this map the route of Goës is entered, though some of his names are missing. There are, however, Parvan on the Hendoukech, Gialalabath, Talkan, Cheman, Badascian, Ciarcunar, Sarpanil, Sarcil, Tanghetar, Jaconich and Yarkan. About the same conception of the orography returns on Delisle's map of 1723. Petit Tibet and the geography of Goës are the most dominating features in the region where the Western Kara-korum is situated.

From the same year, 1723, dates the little map published by PETIS DE LA CROIX in his edition of SHEREFEDDIN ALI, and of which I have reproduced here Pl. VII.¹ On this map, Caschgar and Hyarkent are shown as *one* town with two different names. East of it is Cotan, situated on a river directed to Acsoû. East of Cotan is the considerable mountain range of Carangoutac. To the south of these regions is G. Tebet, the western half of which is filled with mountains, and where we recognize Sarcil P., Badascian and P. Tebet.

¹ *Histoire de Timur-Bec*. Tome second, A. Delf, MDCCXXIII.

I. 2. p. 1.



Map of Mogolistan in the French edition of Sherefeddin Ali, 1723.

CHAPTER VIII.

STRAHLENBERG AND OTHERS.

Continuing our chronological review of European knowledge of Tibet in general, the object of which is to trace the first uncertain appearance of the Kara-korum and to show how this mountain system finally comes out from the mysterious darkness in which it had been hidden ever since the creation of the world, we now come to the Jesuit, JOSEPH STÖCKLEIN, who, in his *Neue Welt-Bott*, at least mentions Tibet. The scanty information he has obtained, seems chiefly to be derived from the *Lettres édifiantes*. In his collection there is a letter from FRANC. BORGAS KOCH to R. P. Anton Mordax in Wien, written at Goa in 1706 and speaking of a projected mission journey to Tibet. The passage in Koch's letter in which Tibet is mentioned runs as follows:

Das Glück hätte mich bald getroffen, dass ich von meinem Oberrn wäre dahin (Agra) geschickt worden, um allda zu verbleiben; allein, indem ich dieses schreibe, wird mir angedeutet, ich solle auf einem Schiffe, so ganz segelfertig ist, nach Surate fahren, und mich von dannen zwar nach Agra verfügen, um daselbst die Thibetische Sprach zu erlernen, demnach aber meine Reise mit Patre Martineti, einem Wälschen Jesuiten ferners nach dem Reich Thibet fortsetzen, welches zwischen Mogol, Persien, der Kalmukischen und grossen Tartarey, und dem Ertz-Reich Sina ligt; weil nemlich der König von gedachtem Thibet sehnlich um Missionarios anhält, und wir in dessen Gebiet die ersten Christum verkünden werden. Ich brech ab, und eile auf das Schiff¹

I am not able to tell whether the planned journey of Koch was ever carried out or not. He seems not to have heard of ANDRADE who 82 years before, had preached in Tibet, though it may be regarded as certain that Tsaprang in those days was not considered a part of Tibet. Koch places Tibet between India, Persia, the regions of the Kalmuks, Tartary and China.

¹ Joseph Stöcklein S. J., *Der Neue Welt-Bott. Allerhand so Lehr- als Geist-reiche Brief, Schriften und Reis-Beschreibungen, welche von denen Missionariis der Gesellschaft Jesu aus Beyden Indien, und andern über Meer gelegenen Ländern, seit An. 1642 biss auf das Jahr 1726 in Europa angelangt seynd. Jetzt zum erstenmal Theils aus Handschriftlichen Urkunden, theils aus denen Französischen Lettres Edifiantes verteutscht und zusammengetragen*. . . Augspurg und Grätz, 1726, Theil V, p. 83.

The mountains north of India are mentioned under the name of Ima in a letter from the R. P. VENANTIUS BOUCHET dated Pondisherry, April 1st, 1719, in which it is said:

Diese gantze Landschafft Ost-Indien herwärts des Ganges wird durch das Gebürg Gat von der Comorinische Spitz an biss zu dem Berg Ima in zwey Theil entschieden. Obwohl aber Ptolomaeus denselben Imao nennet und andere Geographi ihm andere Nahmen geben; so heisst er doch sowol bey denen Indianern in ihrer heutigen Sprach, als auch in ihren alten Büchern Ima, mit Versicherung dass in solchem der Fluss Ganges entspringe.¹

In the same letter the source of the Indus is placed either in Kashmir or in Ima, Himalaya:

Wo der Fluss Indus eigentlich entspringe ist noch nicht ausgemacht: etliche Indianer setzen dessen Ursprung in der Landschafft Caschemir, andere aber in dem Berg Ima. Der Ganges ist ohne Widerrede der grösste Fluss in gantze Asien.

We now come to the famous work of ABUL GHÂZI BAHÂDUR, the manuscript of which was bought by some of the Swedish officers who were prisoners at Tobolsk, from a merchant of Bokhara and who had it translated into Russian and other languages.²

Of the two maps illustrating this work, the editor gives the following information in his Preface, p. XIX:

To illustrate his observations the better, the Editor has prefixe'd two Maps to the Tatar History: The first shews the State of Tatary in the time of Zingiz Khân, with the situations of the several Tribes of the Turkish Nation; the other is a Representation of it as it is at present; both of them are curious in their Kind, and have several Improvements former Maps want.

Amongst other things he says that the Country of Khowârazm has undergone »a thorow Reformation; Turkestân has got into its right Place; in short, the whole puts on a new Face, and is represented in a Form very different from what it bears in other Maps«.

But the editor admits the maps are defective in some respects.

The first of the two maps mentioned in the quoted passage, is represented in Vol. I as Pl. XLIV from the French edition of Leyde, 1726, and the second as Pl. XLIII. In the English edition the first one has the title: *A Map of the Northern Asia as it was about the time of the Grand Invasion of the Tatars into the Southern parts of Asia under the Conduct of Zingis Chan; adapted to the Genealogicall History of the Tatars.* The second is called: *A New Map of the Northern Asia drawn from the most Authentick Observations.*

They are interesting in so far as they call the mountains north of Caschemir Mus Tag and Imaus Mons, which may be said to be the first appearance of the

¹ Op. cit., Theil VII, p. 112.

² *A General History of the Turks, Moguls, and Tatars vulgarly called Tartars. Together with a description of the Countries they inhabit. Translated from the Tatar Manuscript written in the Mogul Language by Abu'l Ghâzi Bahâder, Khân of Khowârazm. The whole made English from the French, with several Improvements and Additions.* London: MDCCXXX.



A German Map of Asia, 1719.

GEN. STAB. LIT. ANST. STHLM.

Kara-korum, though of course under very rudimentary forms. This Mus Tag cannot, however, be regarded as being meant to be a part of what we now call the Kara-korum, which also is shown by LANGE'S map of 1727, where Imaus, *i. e.* Himalaya, is the same as Mus Tag. Such is also the case with the German map of 1719, reproduced here as Pl. VIII. Between upper India and Eastern Turkestan it shows a mountain range stretching W. N. W.—E. S. E. and called Mvsart, Mvstag, M. Nivosus. Talai L. or Manasarovar, is also entered on it.¹

In the *General History of the Tatars*² the Kingdom of Little Bucharía or Cashgar is described, and of Yarkand it is said:

As the Town of Yerkeen is the Resort of all the Commerce which is carry'd on at present between the Indies and the North of Asia, also of that which subsists on one side between Tangut and Siberia, and on the other side between Great Bucharía and China: 'Tis natural for it to be very rich and well peopled, especially if it be consider'd that 'tis by means of the Buchar Inhabitants of this Town that these different Countries have a Communication together, and that for this reason all the Profit of Trade must rest in their hands.

Such was the state of things when ABUL GHÂZI KHÂN, who died in 1663, wrote his history. Yarkand was the great trade centre between India and Northern Asia, and between east and west. The author here indirectly mentions the great trade road of the Kara-korum Pass. The Kara-korum is also unconsciously indicated amongst the high mountains enclosing Kashmir from the north and mentioned in the following passage:³

The Kingdom of Cashemir is situate at the extreme Parts of the Dominions of the Great Mogul: 'Tis bounded on the East with Tibet, on the South with the Provinces of Lahor and Cabul, to the West with Grand Bucharía, and on the North by Little Bucharía, or the Kingdom of Cashgar. It may be about thirty German Leagues long, and twenty broad, and is intirely inclosed with high Mountains which separate the Indies from Great Tatary, insomuch that there is no entring on any side but by passing Rocks of a prodigious Height A thousand little Springs which issue on all sides from the Mountains, form there a fine River, which, after watering the Plains of this little Kingdom, falls down the Rocks of an astonishing Height, to go meet the River Indus at the Town of Atek.

STRAHLENBERG'S work and his great map have been discussed in Vol. I, p. 246 *et seq.* It is, therefore, sufficient in this connection to add only a few words regarding his view of the region which interests us here. Between Magni Mogolis Imperii pars and Mugollia or more especially Bucharea Minor, which is the same as Eastern Turkestan of our days, he has on his map, Pl. XLIX, Vol. I, the ordinary latitudinal range which he calls Mus Tagk aliás Imaus Mons. From this two meridional ranges start to the north, the eastern one being called Mus Tag olim Paropamisus,

¹ The title of this map is: *Tab. Geogr. Asiæ ad emendatiora, quæ adhuc prodierunt exempla jussu Acad. Reg. Scient. et eleg. Litt. Boruss. descripta.*

² Vol. II, p. 471.

³ Op. cit., Vol. II, p. 760.

identical with a part of the Ts'ung-ling of the Chinese and with the Kashgar Range of Burrard, the western called M. Belur alias Bulut, *i. e.* Montes Tenebrosi. In the north, about west of Ierken (Yarkand), the name Belur M. is once more written across both ranges. A little farther north they join to *one* range, called M. Terek Daban. Both Amu-daria and Sir-daria are drawn as taking their origin from the west side of this western range. Between the two meridional ranges is a plain called Planities Pamer alias Arschmaki. The latter name is not found in Strahlenberg's text, and I cannot make out its meaning. South of the Planities Pamer is Mus Tagk alias Imaus Mons. The name Mus Tagk is entered on the map just between Pamer and Caschemir, and one, therefore, feels very much tempted to identify it with the Kara-korum. But the »alias Imaus Mons« seems to complicate this interpretation, as Imaus ordinarily is Himalaya, and Strahlenberg has explained in his text that the Turki word *mus* is the same as (I) *m* (a) *us*. He says:

Eben aber also ist es auch mit dem Nahmen Imaus, welches die Tatern in ihrer Sprache Imaustag auch Imussahr nennen, denn Mus oder Maus heisset bey ihnen Eiss, vor welches sie den vocal I in der Aussprache setzen, Tag aber bemercket Gebürge, welches also das Eiss- und Schnee-Gebürge andeutet; Daher denn diese corruptierte Benennung Imaus entstanden.¹

On Strahlenberg's map the Imaus Mons is the range from which the Indus and Ganges take their origin. South of this range there are other, more detached mountains, which, indeed, have to be identified with the Himalaya, for at their southern base we find Atock and Nagra-cut, and between them and the Imaus Mons is Caschemir. The more regularly defined range Imaus Mons is bordering Regnum Chotena and Provincia Karia (Keriya) on the south, and ought, therefore, to be identified with the Kwen-lun. As now the Himalaya is indicated south of this Range, Strahlenberg's Imaus Mons cannot be identified with the Himalaya, but is indeed meant to be the Kwen-lun.² The Mus Tagk Range, which constitutes the immediate western continuation of the Imaus and is situated south of the Pamer and north of Caschemir, and has M. Hendukesch as its direct western continuation, may, therefore, in reality be identified with at least the northern part of the Kara-korum System. As shown above, the name Mus Tag had been entered on maps a few years before Strahlenberg published his work. But on Strahlenberg's map we are able for the first time to prove that a part of the Kara-korum System has been represented.

A few passages of Strahlenberg's text may be worthy of quotation. In the beginning of his work he says that he has noticed that Curtius, Plinius and other

¹ Philipp Johann von Strahlenberg: *Das Nord- und Ostliche Theil von Europa und Asia*. . . . Stockholm 1730, p. 326 and 49. His Imussahr is the Turki Musart.

² In this respect I have made a mistake on p. 250, Vol. I, where I regard his Imaus Mons as being identical with the Himalaya.

classical authors call the mountains Pamer — Paropamisus, a conclusion to which he has been lead by a certain phonetic resemblance between the two names.¹

Sometimes he misunderstands the classical authors and goes too far in his conclusions. When Plinius says: *Quid Thraces, quid Seres faciunt*, Strahlenberg adds that Plinius, under the name Seres, means quite another people than the Chinese, because the distance between the two nations is very great. He says:²

Denn, wie hätte Plinius die Chineser hierunter verstehen können, indem zwischen Thracien und China nicht allein eine Distance über die 600 deutscher Meil Weges, sondern es liegen ja in gerader Linie zwischen diesen beyden noch die schönsten jemahls bewohnt gewesene Länder, als die Usbekei, das Regnum Caschar, das grosse Land Choteen, it. Tibeth & c. wie hätte er denn die Thracier mit denen Chinesern (als so genannten Seribus) connectieren, und solche schöne Länder überspringen können? Zumahl es auch ausserdem bekandt, wie sich die Chineser selbst nicht gerne aus ihrem schönen Lande, zum Handel und Wandel in andere Länder hinein begeben; sondern wer von ihnen Waaren haben will, der muss solche selbst hohlen. Und dergleichen Dinge habe nicht allein aus dem Marco Paulo Veneto, Rubriquis, Goes und andern alten Scribenten, sondern auch aus denen neuern berührt und corrigiret.

He divides Central Asia in six principal parts, the sixth of which is Thibeth and Tangut where Dalai Lama or the Priest Johannes has his residency.³

Speaking of the general hypsometrical relations of the interior of Asia, he says:⁴

Komme ich aber hingegen von Süden aus Persien und Indien, so berichten uns nicht allein die ietzigen reisenden Tatern, sondern auch Marcus Paulus Venetus, lib. I Cap. 37. it. Goes und andere welche von dieser Seite in die Tatarey gegangen, dass sie beynahe 3 Tage zugebracht, ehe sie die Höhe der Tatarey über die Gebürge, Belur und Pamer genannt, erreichen können.

Finally, regarding the part played by the Caucasus and Taurus he expresses his views in the following words, which seem to indicate that his Taurus includes both the Himalaya and the Kara-korum:⁵

Durch was für sehr hohe und lange Gebürge sonst das Russische Reich nicht allein von andern Ländern und seinen Nachbarn, sondern auch innerhalb abgetheilet ist, wird aus anderer, als auch dieser meiner hiebey gehenden Geographischen Charte zu ersehen seyn; Denn gegen Mittag und Persien hat solches den Caucasum, und innerhalb wird es durch die Riphäischen Gebürge, und den per abusum so genannten Imaum abgetheilet derer alten Autoren so bekannter Taurus aber berühret solches war nicht, scheidet aber die Usbeckisch und Kalmuckische Tatarey von Indien.

In this passage Strahlenberg thus regards the Taurus as separating the Usbeck and Kalmuk Tartary from India. As a rule it may be said of his orographical conception that it is by far superior and much clearer on his map than in his text.

¹ Op. cit., p. 8.

² Op. cit., p. 9.

³ Op. cit., p. 13.

⁴ Op. cit., p. 107.

⁵ Op. cit., p. 324.

On his map he makes use of the information he was able to collect in Tobolsk and other parts of Siberia during his captivity, but in his text he has made himself too much dependent upon the classical geographers. In the history of geographical research in Central Asia, his name, however, occupies a very prominent place.

We cannot pretend to find any trace of the Kara-korum System on RENAT'S map of 1733.¹ I have already mentioned² that the hydrography of Eastern Turkestan on his map is nearly correct, especially regarding the Kashgar-daria, Yarkand-daria and Khotan-daria. But the towns Ierken and Choton are removed one step too far east, and thus Yarkand comes to be placed on the Khotan-daria. South of Eastern Turkestan he has the mountain range of Mustack or Mustagh, which here in reality corresponds to the Kwen-lun and not to the Mustagh-Kara-korum, of which Renat could not have the slightest notion. I have said above³ that Renat's Khotan-daria is drawn as if it comes from a lake Charchol which I believed could be the Kara-kul. This presumption, however, I think cannot be maintained. The name Charchol rather indicates a country than a lake, and it may be a corruption of the name Sarkol, Sarikol, Sarik-kol. This would seem the more probable as, just south and S. W. of Charchol, the people Siara-kolser, *i. e.* Siara-kols or Siara-kolians, inhabitants of Sarikol, is entered. East of the latter are the Kasmirer, *i. e.* Kashmirians, and west of it Badaschaner or Badakshanis. For the Kara-korum, there is no room on the map.⁴

In an atlas entitled *Bequemer Hand Atlas aus 26 Hommanischen Landkarten....* etc. A. 1754, there is a map with the title: *Imperii Russici et Tatariae Universae.... Tabula....* Joh. Mathiae Hasii.... Norib. A. 1739, of which Pl. IX is a reproduction.⁵ On this map the general geography S. W. of Eastern Turkestan is superior to that on RENAT'S map. The Kashgar Range is here called M. Tenebrosi, and west of it is the country, Vagian, obviously Vakhán. To the south of the latter is Balur and R. Bedacschan. Kashgar-daria, Yarkand-daria and Khotan-daria are all entered, though less correctly than on Renat's map. S. E. of Khotan-daria is a river, parallel with it, and running S. W.—N. E. One would think it ought to be the Keria-daria. The fact that it on the map, as in reality, never reaches Yerken f., or Tarim, is only a chance. It is called Kotomni f. At its end in the desert is Peim, at its middle

¹ Pl. L, Vol. I.

² Vol. I, p. 256.

³ *Ibidem.*

⁴ In his excellent work, *Russia, Mongolia, China*, Vol. I, London 1919, p. CCIV, JOHN F. BADDELEY, has already expressed his doubts regarding my first identification of the name Charchol. He says: "The only point that calls for notice here is that Dr. Hedin takes Sharkol to be Lake Kara-kul, as, from the relative position of Mustak, might well be supposed. But Sharkol is marked, seemingly, as a town, presumably 'the town Sharagol' of Filisoff, and it lies on the same river as Yarkand; so that, while leaving the ultimate verdict to expert judgment, I retain, provisionally, my identification of Sharkol with Sharagol, and of both with Saricol." — There is not the slightest doubt about the identification of Mr. Baddeley being the only correct one.

⁵ I am indebted to Mr. Emil Trinkler of Bremen for having directed my attention to this map.

course, Tibet, and at its upper course, Cheker, Eskerdou and Tobbot, *i. e.* Little Tibet and Skardo. Just south of the sources of the river is also the country, Tibet Minus, and south of it again Mvs Tagi and Caschmir. Thus on this map, the Mus-tagh, whatever may be meant by this word, is situated between Kashmir and Baltistan, and Skardo is placed in Eastern Turkestan.¹ Between the sources of the Khotan-daria and Kotomni f., there is a curious mountain range stretching S. W.—N. E. and called Kirian M., probably Kilian-davan, or Keria-davan. Between the middle courses of the same rivers is a lake called Anya L. Could it be a mistake for Aneota or Anavatapta, a new manifestation of the Manasarovar? Several of the names are obviously taken from D'ANVILLE. The latter has La ville de Hotom ou Kotan on the Khotan-daria, called Hotomni-Solon Mouren by him, the end of which he puts in the sands. To the east of the upper part of this river, he has a lake Anja Nor south of which the Kirian M. is situated.

In 1718 the Jesuits in China delivered the new map of Tibet to the Emperor. It had been surveyed by intelligent Lamas and checked with existing materials. In Paris a copy of the same map was prepared for publication by d'Anville. The Lamas had proceeded so far as to Manasarovar and Kailas, but they had not extended their surveys to the Kara-korum regions which, therefore, are missing on d'Anville's map (Pl. I, Vol. III). On the other hand, it seems obvious from his map that d'Anville, either from the Lamas or from some other source, has obtained news of the existence of a trade road between Ladak and Eastern Turkestan, a road that seems to have been running east of the Kara-korum road, or between Rudok and Khotan, for only between these two places have mountains been entered on the map, and along with them the following names: Routou (Rudok), west of it Nouptra M. (Nubra M.), and S. W. Latatsi MM. which may be meant to be Ladaki MM. Then follows Dsarin Nor, which, being N. W. of Rudok, may be the Panggong-tso or Niak-tso or any of the lakes in the neighbourhood. The existence of the lake, at any rate, proves that the road ran on the plateau-land from which there is no drainage to the sea. Then follows Frontiere de Pouroun, which I cannot identify, unless it is a corruption of Rudok Pun or Governor of Rudok. Kenkri-Mouson indicates the highest

¹ G. V. CALLEGARI has the following correct opinion regarding the orography of the maps of Strahlenberg and Hasius (Hase):

Indubbiamente tanto l'opera dello Strahlenberg, come la carta *Nova descriptio geographica Tartariae Magnae* etc. ebbero un' importante influenza in quell' epoca. Tutto ciò che era noto intorno all' orografia dell' Asia centrale per mezzo delle relazioni di viaggio, che il Wisten aveva raccolto un poco disordinatamente, giovò allo Strahlenberg per sostenere la suaide a intorno l' »alta Tartaria» ossia l' »alta Asia».

Contemporaneo dello Strahlenberg è Giovanni Mathia Hase, l'autore della *Tartariae majoris sive Asiaticae tabula, quae presertim complectit Tartariam Russicam*, etc. che pone al posto del Mus Tagk dello Strahlenberg una massa montagnosa chiamata »Nivosus mons». *Il grande attopiano dell' Asia Centrale*. Feltre 1911, p. 63.

mountains covered with eternal snow, for *Kenkri* is certainly the Tibetan *Kangri*, snow-mountain, and *mouson*, the Mongolian *musun*, ice. Near Frontiere d'Yerghien, or boundary of Yarkand, we find the mountains, Lapoutsi M. and Tchac M., which I cannot make out. Finally there is a Kirian M., Keria or Kilian Mountains, as suggested above.

D'ANVILLE'S map of 1733 may be said to be the first on which there is space enough left for the Kara-korum System. Though the system itself is missing, there is a road crossing it, and the map indicates by its *Kenkri-mouson*, that very high mountains are crossed by the road. The mountains entered at both sides of Routou, Rudok, are indeed parts of the Kara-korum System. And it may be said that this map is the first we know of, on which we find a rudimentary representation of one single crossing of this enormous system, great parts of which still at present remain unknown.

Already some 18 years before d'Anville's famous map was published, a European, IPPOLITO DESIDERI, seems to have crossed a part of the southern Kara-korum System. He mentions Baltistan or Little Tibet, which indeed belongs to our system. On August 17th, 1715 he left Leh and if it is correct as I have tried to show¹, that he travelled to Tashi-gang *viâ* Rudok — for he speaks of the wide waterless plain of Cianghthang — he has crossed a part of the Kara-korum Mountains. Of Tibet Proper or Butan, which in the language of the country was called Po, he says: »To the north it is bounded by hard and desolate places, being the way which leads to high independent Tartary and the kingdom of Yarkand.» And further: »The third Tibet is so vast, that one needs six months good and continuous journey between Gartok and Sining. Its breadth is very different in different places. The province of Zang-to, which is 2½ months across, stretches far to the north to the wild rocks which are on the frontier of the kingdom of Yarkand, and to the impracticable mountains which form a wall to high independent Tartary or the country of the Dsungarians.» In the east he just only notes the existence of a road from Lhasa *viâ* Sining to China and the Lower Tartary.²

He thus not only touched a part of the Western Kara-korum on his journey, but also had knowledge of roads crossing the whole system, both in the west and in the east, though of the system itself he could, of course, not know anything. In an article: *Notes sur le Tubet par le P. Hippolyte Desideri, recueillies par N. Delisle*, the road from Yarkand to Ngari, crossing the Kara-korum, is also mentioned as follows: Pour aller de Yarkand au Tubet on passe par le désert de Ngari Jongar, auquel on arrive par un passage entre deux montagnes qui nulle autre part ne sont praticables. Le pays de Ngari Jongar dépend du Tubet.³

¹ Vide Vol. I, p. 272.

² Vide Vol. III, p. 12.

³ *Nouveau Journ. Asiat.* Tome VIII. Paris 1831, p. 119. This article was published by Klaproth.

PIERRE BERGERON has not brought the knowledge of our mountains any farther. His description of the narrative of the »habile Moine Bacon« begins: Les Indes, sont bornées au septentrion par la mer de Scythie, et ces grandes montagnes, qu'on nomme Caucase & Taurus, & auxquelles on donne plusieurs autres noms, selon la diversité des lieux & la différence des peuples.

In his description: *Histoire Orientale de Hailon, Armenien*, it is said that the Tartars formerly lived beyond the great mountain of Belgian. Seven nations originated from the ancient Tartars. La premiere de ces nations est nommée Tartar; . . . la seconde se nomme Tangot; la troisieme Cunat; la quatrieme Jalair; la cinquieme Sonich; la sixieme Monghi; & la septieme Tebeth.¹

In his résumé of ANDRADE'S journey he expresses the opinion that Andrade's Tibet: sans doute est la Tebeth de Marc Pole & des autres Historiens de ce tems-là.²

Another collector of narratives of Travels, THOMAS ASTLEY, gives at a few places, short general descriptions of the countries dealt with. Of Tibet he says: »Although Tibet is a country of very large extent, yet it scarcely appears in our maps, before those published by De l'Isle. It was there represented as a narrow Kind of Desart, lying between India and China, without either Towns, Rivers, or Mountains, although no Part of Asia abounds more with the two latter.»³

In his introduction to the chapter: A Description of the Kingdom of Karazm, we find how little was known of these parts in 1747:

Between Great Tartary on the North, and Tibet, India, and Persia on the South, there runs a long Tract of Land, extending from the Great Kobi, or Desart on the North-West Part of China, Westward, as far as the Caspian Sea. This Country is situated in a sandy Desart, with which it is surrounded; or rather is itself a vast sandy Desart, interspersed with Mountains and fruitful Plains, well-inhabited and watered with Rivers.

Nature seems to have divided this Region into three large Parts, separated from one another by the Intrusion of the Desart, and known at present in these Western Parts, by the Names of the countries of Karazm, Great Bukhâria, and Little Bukhâria. The original Inhabitants, who are very different from the Tartars, were always great Traders; and Karawâns frequently pass through their Lands from India and Persia to China: But as they have been but little visited by Europeans, we had scarce any Account of them, but what is met with in the Translations and Extracts from the Oriental Writers, till Mr. Bentink obliged the Public with his Notes on Abu'lghâzi Khân's Genealogical History of the Tatars.⁴

Other sources mentioned are only Jenkinson, Goës and Tavernier.

In the chapter on Great Bukharia, he approaches our regions somewhat nearer:

Badagshan is situated at the Foot of those high Mountains, which separate the Dominions of the Great Mogul from Grand Tartary . . . Those Mountains are called, in

¹ *Voyages faits principalement en Asie dans les XII, XIII, XIV, et XV siècles* . . . Tome II, A la Haye MDCCXXXV, p. 3 and 26.

² Op. cit., Tome I, p. 102.

³ *A New General Collection of Voyages and Travels* . . . Vol. IV, London, printed for Thomas Astley, MDCCXLVII, p. 449.

⁴ Op. cit., p. 476.

the Mongol Language, Belûr Tâg, or, the dark Mountains: In them rises the River Amû, there called Harrat; on the North Side of which Badakshân stands, about one hundred Miles from its Source.¹

In the same volume of Astley there is a map of Little Bukharia the greater part of which is simply copied from d'Anville (Pl. X). Its western portion is interesting so far as it shows »Belur tag or the dark Mountains» only as a legend. The excellent representation of the Pamir and the meridional ranges of Belur and Mus Tag of STRAHLENBERG 17 years before, is missing on this map, where there is really no orographical connection at all between Great and Little Bukharia.

The German work: *Allgemeine Historie der Reisen zu Wasser und zu Lande oder Sammlung aller Reisebeschreibungen....* Band VII, Leipzig 1750, seems as far as Tibet is concerned, simply to be a verbal translation of Astley's collection, Vol. IV. The map of d'Anville here appears in a somewhat different form than in Astley, and the mountain range of Purun occupies exactly the place where the Kara-korum is situated (Pl. XI).

From the Italian work, *Missio Apostolica, Thibetano-Seraphica*, a German edition was published in 1740. It does not contain very much of geographical interest, and, of course, nothing at all of the Kara-korum System, but for completeness' sake I will quote *in extenso* what it has to say of Tibet.²

Das erste Capitl.³

Kurtzer Entwurff von der Situation oder Gelegenheit der Thibetanischen Tartarey.

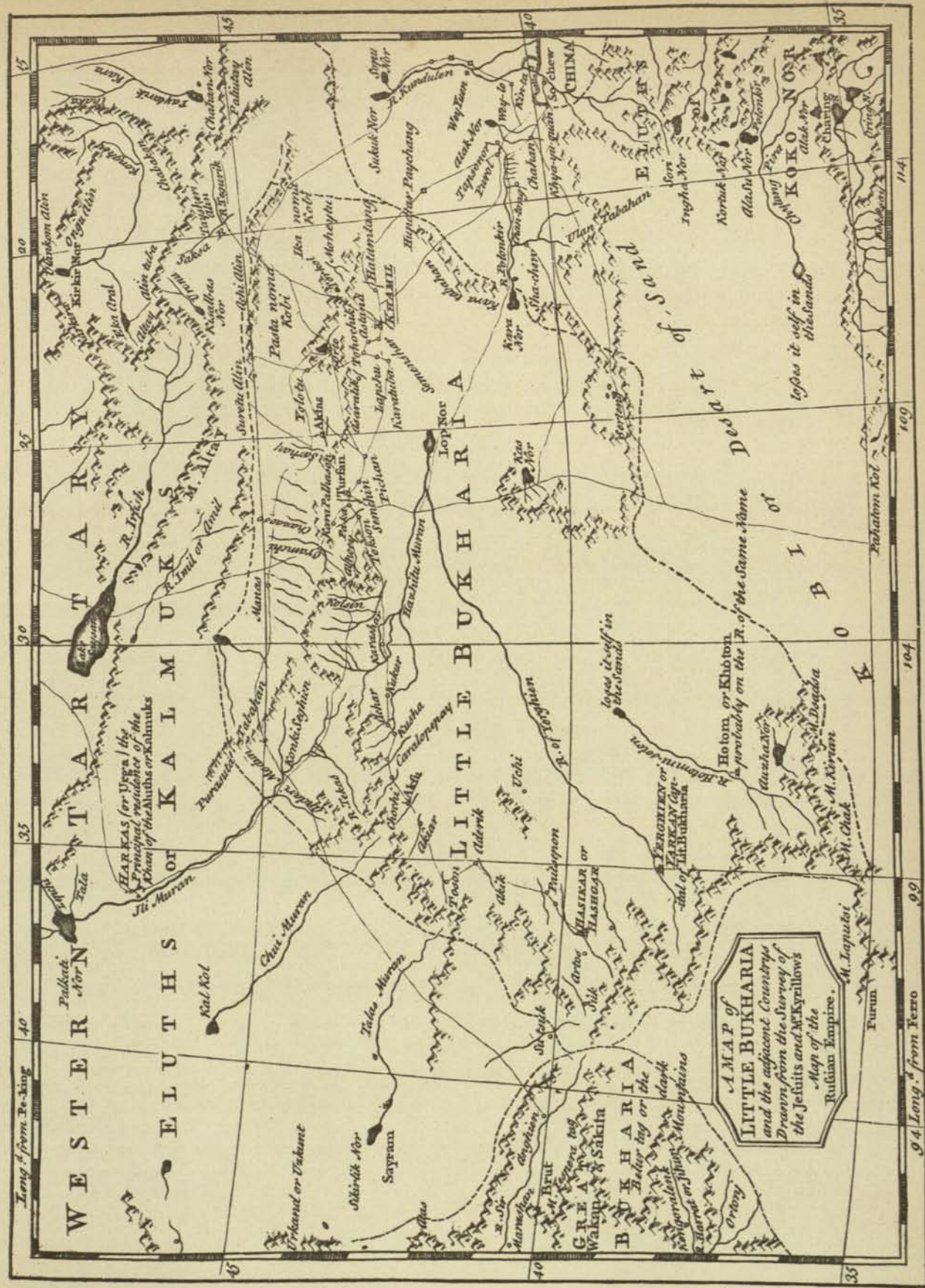
Dieses Thibetanische Tartarien oder Tartarey scheidet sich ab in 2. Theil deren einer das kleine, der andere aber das grosse Thibet genennet wird. Das kleine Thibet, so man in Ansehung dess anderen nemblich des grossen pflegt zu benambsen, das Occidentalische oder von Nidergang der Sonnen dessen Inwohner dem Machometanischen Gesetz beygethan und dem Gross-Mogol Zinsbar unterworfen seynd, gegen seinen Mittag stosset es an die Landschaft Kasomir, gegen Mitternacht und Nidergang an die Tartarey Usbecs, gegen Aufgang aber an das Königreich Kascar. Das Oriental — oder Morgenländische Thibet wird auch von den anderen entschieden durch den Namen Gross-Thibet.

Die recht abgezeichnete Geographische Tafel oder künstliche Land-Charten zeigt an, dass besagte Land seye nach der Nord oder Mitternacht breite zwischen den 27ten und 35ten Grad, der länge nach aber zwischen den 100. und 118ten Grad gelegen.

¹ Op. cit., p. 519.

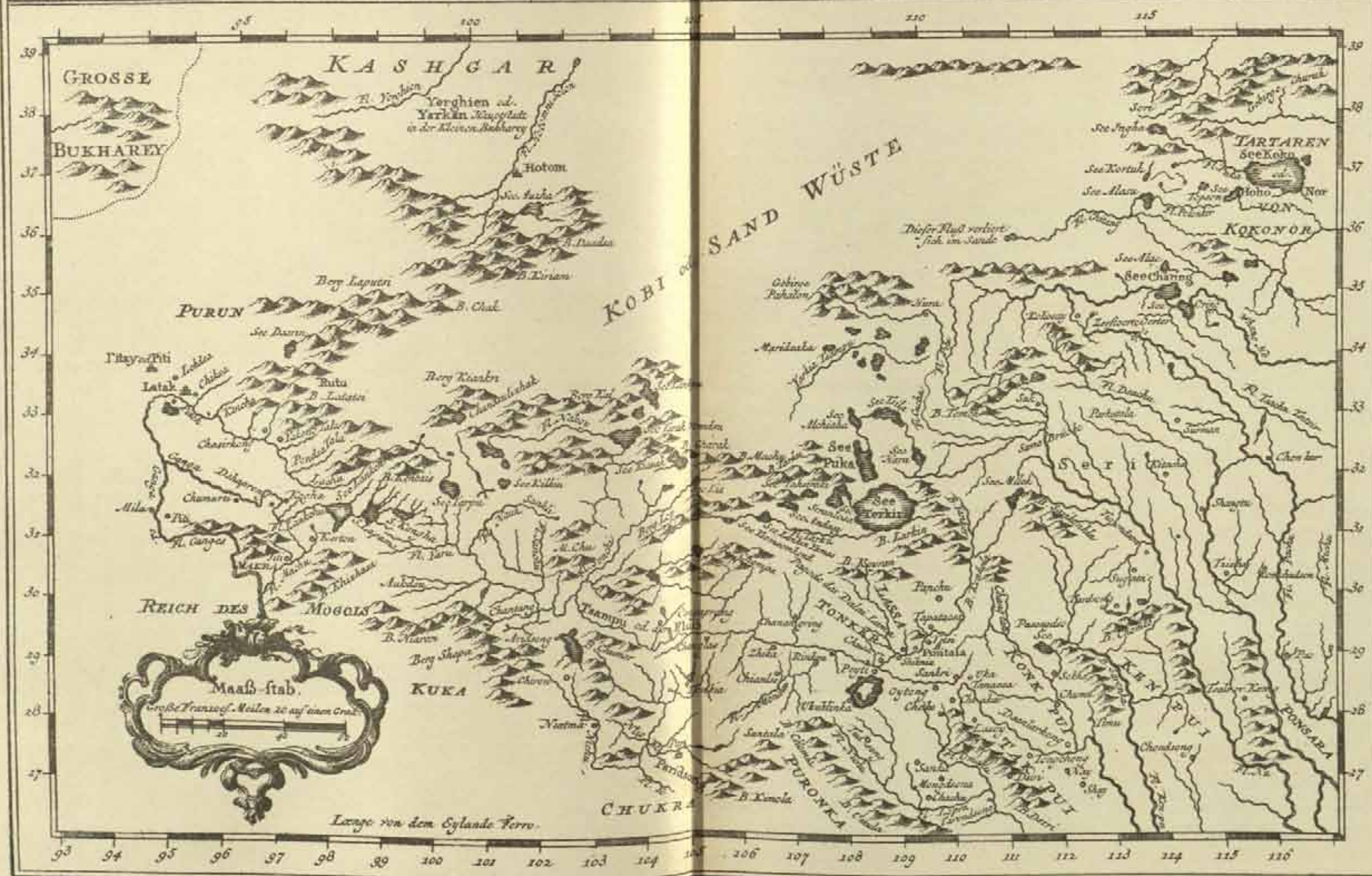
² The full title of the work is: *Missio Apostolica, Thibetano-Seraphica. Das ist: Neue durch Päbttlichen Gewalt in dem Grossen Thibetanischen Reich Von denen P. P. Capucineren aufgerichtete Mission Und über solche Von R. P. Francisco Horatio della Penna, praefecto missionis, der Heil. Congregation de propaganda fide, Anno 1738 Beschenene Vorstellung Von Rev: mo & Illust: mo D. D. Phillipo de Montibus, dermahligen S. Congregat. Seretario in Rom, zum öffentlichen Druck beförderet, Hinnach Allen des Catholischen Glaubens eyfrigen Seelen zu Lieb, aus dem welschen in das Teutsche und diese Geschichts-Form übersetzt. Von F. E. C. I. einem Priester Capuc. Ord. der Chur-Bayrischen Provinz. Erstes Buch: Thibetaner-Religion, und Lebens-Arth. Cum Licentia superiorum & Priv. Sac. Caes. Majest. München gedruckt und zu finden bey Johann Jacob Vötter, Churfürstl. Collnis. Hof-, wie auch Gem. Löbl. Landschafft und Stadtbuchdruckern allda Anno 1740.*

³ Op. cit., p. 5—7.



A Map of Little Bukharia, from Astley's Collection, 1747.

KARTE VON GROSS THIBET zu der Allgemeinen Reisebeschreibung. Aus den Englischen Schriftstellern von M. Bellin Ingenieur de la Marine 1749.



Karte von Gross Thibet zu der Allgemeinen Reisebeschreibung. Aus den Englischen Schriftstellern von M. Bellin, 1749.

Es gränztet von Mittag mit dem Königreich Acham, von Mitternacht mit Turchesten, und deme Königreich Tangut an, von deme zu anderen Zeiten Thibet einen grossen Antheil genosse; gegen Aufgang aber stehet es in der Nachbarschaft mit dem Chinesischen Reich und gegen den Nidergang mit denen Ländern dess Gross-Mogol, von welchen es abgeschnitten wird durch selbe lange Ketten dess Gebürs Purbet, oder sonst Naugracurt benambset, gestalten allda fort lauffet der Berg Immao dem Caucaso anhängig, welcher auch noch heut zu Tag gleichwie vormahls bey denen Alten das Indien von der Tartarey, so sie Scythien nenneten, abtheilet. Das ruchbariste ihrer Königreich ist jenes von Boutan, also pflegen es die Indoustaner zu heissen, von uns wird es belegt mit dem Namen Thibet, angleichen auch Lhasa, also benambset von dessen Hauptstadt, die eben disen Namen führet.

Wegen seiner Situation, oder Gelegenheit dess Orths, zehlet man dass Gross-Thibet unter jene Landschafften, so den Mittel-Punct dess Asien ausmachen, dieweilen es aber durchauss gebürgig und mit unfruchtbaren Bergen fast auf alle Seiten umgeben, deren Spitze stäts mit Schnee seynd beladen, welcher dann bey seiner Auflösung so gräuliche Wasser-Güss erwecket, dass solche zwischen den bergigten Felsen sich abstirtzend den gantzen Weeg mit lauter Ungemach und Aengsten anfüllen allermassen der Wandersmann Noth getrungen wird dieselbige auf den allerschmälligsten Brücklein, so ohne Seithen-Geländer mit gantz unsicheren und ungegründeten Fuss zu übergehen und ihnen auszuweichen; ist demnach dieses Land der freyen Handelschafft deren sonders Gewerbzig unverdrossenen Europäischen Nationen noch nicht eröffnet, von deren heiss hungerigen Begirlichkeit und Geld-Hunger es noch immerzu erhalten die überauss kalte Lufft und rauche Wind so allda regieren wie auch die angewohnt einfältig und grobe Lebens-Arth selber zahlreichen Völckeren die sich keines Weeges gelusten noch ihnen traumen lassen von einigen Ueberfluss, so ansonst gemeiniglich denen aussländischen Commerciem und Gewerbschafften den Passport pfelet in die Händ zu spihlen und den freyen Weeg zu pannen.

According to this source, Tibet is separated from India by the Mountains Purbet and Naugracurt, *i. e.* Himalaya. There runs also the range, Immao, which is in connection with the Caucasus, and which may be regarded as the high Himalayan ranges. The author also knows that Tibet is surrounded by snow-covered mountains.

The first chapter of the second book (p. 4 a. 5) of the same work, has the title: Die Heilige Congregation sendet einige P. P. Capuciner ab, um eine Mission in Thibet anzurichten; and there the following information may be of interest:

Es lauffete das Jahr 1707, in Monath Junio, als eben die Missionarii eingeloffen zu Chandernagor einen Orth in Königreich Bengala West-wärts an Ufer des Fluss Ganges gelegen, wo sich diser in das Meer ergiesset, und ist alldort ein Factor, oder Gewerbs-Verwaltung von denen Frantzosen zum Behuff und Vorthail ihrer Handelschafft in selbe Land-Theil angerichtet. Von danen haben sich zwei derselben, als Pater Josephus von Ascoli und Pater Franciscus Maria von Tours nach Lhasa, so die Haupt-Stadt in Gross-Thibet, erhoben, deren so curieuse, als denckwürdige Reiss-Beschreibung wie allhier, damit diss Werk nicht zu viel angehäuft werde, indessen vorbeý gehen; es solle aber solche (wann es Gott beliebig) dem dritten Buch diser Mission den Anfang setzen.

Here a third volume of the *Missio Apostolica Thibetano-Seraphica* is mentioned (p. 5). According to Dr. F. SCHILLMANN of the State Library of Berlin, who has kindly provided me with the above extract, only one copy of the work seems to

exist in Germany, so far as he has been able to make out. It is, therefore, difficult so far, to tell whether a third volume has appeared or not. If it exists at all it ought to be found in the Vatican or in some of the earlier Jesuit libraries.

In Vol. I, I have had an occasion to discuss the important part played by Father GAUBIL regarding the history of exploration of the Sacred Lake.¹ Here I will only enter a passage in a letter of his to DELISLE, dated Peking October 13th, 1754.²

Si ceux qui arrivent à Dehli avoient observé la hauteur du terrain sur le niveau de la mer, on pourroit savoir aisément la hauteur du mont Cantisse au-dessus de la mer; car de la jonction de la rivière Ma-tcheou avec le Gange, on doit voir la montagne Cantisse et les voisines. On les dit les plus hautes du Thibet; il y a des monceaux de neige qui ne fondent jamais, et l'on peut les nommer Montagnes de neige, de même que celles d'où sort le grand fleuve Houang-ho, qui a sa source dans la montagne Bayan-kara du Thibet, et le fleuve Mourou-oussou, appelé en Chine Kin-cha-kiang; . . . Ces montagnes Bayan-kara ou Riches-noires, à cause des mines d'or qu'elles contiennent, sont, je crois, plus hautes que le Cantisse, au sud duquel le Gange prend sa source dans deux grands lacs.

As Father Gaubil misunderstood the hydrography, his hypothesis regarding the height of the Tibetan Mountains was incorrect on account of his insufficient knowledge of the country. He was, however, a perspicacious and intelligent scholar.

¹ P. 290 *et seq.*

² *Lettres édifiantes*, Tome quatrième, Edition Paris 1843, p. 70.

CHAPTER IX.

SAMUEL VAN DE PUTTE.

The object of this volume being to trace the stretching of the Kara-korum System through the whole of Tibet, we have to follow the history of exploration over the whole of its extension, not only in the west, where the material is much richer, but also in the east. We have discussed the journey of GRUEBER and DORVILLE who were the first to cross, in 1661—1662, the Tang-la,¹ a system which I believe is the eastern continuation of one of the Kara-korum folds.

The second European to cross the Tang-la System was the Dutchman, SAMUEL VAN DE PUTTE. In our chronologically arranged review of travels and information regarding the Kara-korum and its surrounding regions, we should not forget this sympathetic and brave traveller who accomplished a quite marvellous journey, and of whom so very little is known.

Professor P. J. VETH has collected everything he has been able to find regarding his countryman, and put it together into a very well written biographical sketch which may be regarded as the very best source on van de Putte.²

Samuel van de Putte was born in Flushing in 1690. He was a student of Leiden and got his degree in February 1714. In 1718 he started for Italy where he stayed three years, and then returned home. During his sojourn in Italy he learnt the Italian language so well that he afterwards, and on his travels, used to write his notes partly in that tongue. In 1721 he travelled from Holland to Constantinople, Greece and Egypt. From Cairo he went to Syria, and from Aleppo he accompanied a caravan to Isfahan and farther to Hindustan and Cochin where he arrived in September 1724. In 1726 he visited Ceylon. Disguised as a Moham-medan, he visited different parts of the dominions of Great Mogul.

About his journey to Tibet, very little is known. Veth thinks he left Hindustan in 1729. Quoting the information given by Klaproth in his article on ORAZIO DELLA PENNA, Veth says:

¹ Vol. III, p. 3 *et seq.*

² *De Nederlandsche Reiziger Samuel van de Putte. Tijdschrift van het Aardrijkskundig Genootschap*, Deel II, No. 1. Amsterdam 1876, p. 5 *et seq.*

Het bedoelde stuk werd geschreven in 1730, en vermelt, zoo als straks blijken zal, bijzonderheden aangaande den overtocht door van de Putte van de rivier de Bri-tsjiøe in oostelijk Tibet. Daar hij zich te voren vrij langen tijd in westelijk Tibet en de hoofdstad L'hasa moet hebben opgehouden, mogen wij aannemen dat hij Hindostan in 1729 heft verlaten.

Veth believes that van de Putte's little sketch map¹ gives an indication of the route he has taken for his journey from India to Tibet. An annotation in the north-western corner of the map makes it probable that van de Putte has drawn the sketch during his stay in Lhasa. He says: N. B. 'Questa idea ho formata per domandar al figlio d'un ministro (cioè del Kalon) del Rè di Bramscjon, che m'ha datta qualche elucidatione del suo Paëse, ma e partito di Lhasa senza che ho' avuto l'occasione.

The principal object of the map is to show the situation of the country, Bramascjon. D'ANVILLE in 1752 calls it Brahm-song. The city of Comotay is placed there, and so is also the mount and fortified city of Nagar cut, Nagercut or Nagar koto, which now is called Sâmdang. Klaproth identifies Bramascjon with Sikkim. His detailed analysis of the map, quoted by Veth, would take us too far.

Though it is unknown by which road van de Putte travelled to Lhasa, a second sketch-map, communicated by Veth, seems to indicate that he has also visited Nepal. From Lhasa he undertook the long and adventurous journey by way of Naghtsjioe (Nakchu) and Britsjioe (Brichu) to Koko-nor, the Great Wall and Peking. A detailed description of his itinerary is, of course, missing, but probably he has travelled about the same great road of the Mongolian pilgrims as Abbé HUC, more than a hundred years later. In a letter, now in the state-archives in Holland, van de Putte says:

Van de Tibetaansche hoofdplaatse L'hasa heb ik gereist in groot Tartarijen, voor oude tijden Scythia Asiatica, tot heel benoorden China, door gewesten bij onze landkaarten niet gespecificeerd, uitgezonderd Koekoe-noor, dat is Blauw meer, also in de Eulutsche taal genaamt, omdat deszelfs water daar in een dieskleurige superficte vertoond.

DELLA PENNA, who certainly was in Lhasa at the time of van de Putte's visit mentions Bic'iu (Bri-chu) from a letter he received from the Dutchman, who, in October 1731 had reached the country of Koko-nor. Veth is, therefore, right in the following supposition: Het wordt daardoor zeer waarschijnlijk, dat alles wat wij in de *Breve Notizia* omtrent de reisroute van Lhasa tot Koekoe-noor aantreffen, ann de mededeelingen van van de Putte outleend is. Della Penna had never travelled that road, and why should he quote van de Putte regarding Bri-chu if he had traversed the river himself?²

It is obvious that the rest of this short relation of the road, also used by GEORGI, dates from van de Putte's letters to the Missionary.

¹ Vide Vol. II, Pl. XX.

² The place in *Breve Notizia* here referred to, vide Vol. III, p. 25.

Van de Putte seems to have stayed a rather long time in the country around Koko-nor, where he occupied himself with topographical work. Veth has discussed all the names which from van de Putte's extremely few annotations have been preserved to our time.

Regarding his further journey, van de Putte says in the letter, quoted above, and after having spoken of Koko-nor:

Den seer berugten, weërgadeloosen, over bergen en dalen, voor veele eeuwen tegen d'invallen der Tartaren Opgerigten, groten Chinesen grenswal, ben ik op drie verscheiden plaatsen gepasseerd en eindelijk de vierde intogt met een gedequiseerde naam en inlandse kleding, mijn Europees wezen en blauwe oogen onder voorwending van ziekte zooveel doenlijk onkenbaar gemaakt, en in eene talrijke Kemeltrayn van een aanzienlijk Lama of priester eene dier lastbeesten aan de hand leydende, alle de Chinese wagten, die zedert den aanvang van den actuelen oorlog tusschen den Kayser en de Ziongaren order op order ontvangende niemand zonder patenten der Mandarins, even gementioneerden wondermuur in of uyt te laten trekken, zeer nauw toezien en onderzoeken, tot binnen Peking doorgekomen.

None of van de Putte's annotations after October 1731 have been preserved to our time.

At his arrival at Peking he was refused entrance to the city and had to stay several months in a Lama-monastery outside the city, where the situation of the Christians was very unfavourable just in these days. At last he got an opportunity to accompany a Tatar prince and entered Peking disguised as a camel driver. In a letter from Peking, August 13th, 1752, Father GAUBIL writes:

Bien des gens souhaitent être instruits exactement sur les lamas du Tibet du temps de l'empereur Khang-hi. Les Européens qui étoient à Pékin auroient pu aisément s'instruire là-dessus; on n'en eût pas la pensée. Depuis que je suis ici, nous ne pouvons prudemment avoir grande communication avec les lamas. Du temps de l'empereur Young-tching, un Hollandais nommé M. Van de Put, après avoir couru des pays, alla au Thibet par les Indes. Il fut en considération chez les lamas: quelques-uns de ceux-ci, puissans à Pékin, le menèrent dans leurs principaux temples en Tartarie, et le conduisirent à Pékin, où il vit ce qu'il y a à voir: il savoit, dit-on, la langue des lamas. Ce M. van de Put aura donc pu avoir bien des connoissances sur les lamas.¹

In a note to della Penna's words: L'illustrissimo signor Samuele Van de Putte, Olandese, nativo di Flescingh della provincia di Zelanda,² KLAPROTH gives the following short communication:

Ce Hollandais s'appelait, avec tout son nom, Samuel van du Put. Il était arrivé des Indes au Tübet, où il lia amitié avec des lamas, dont il avait appris la langue. Ils le prirent avec eux à Peking. C'est le seul Européen qui, à ce que je crois, ait fait ce voyage si intéressant de la capitale du Tübet à celle de la Chine. Malheureusement le journal de son voyage paraît perdu pour nous.

¹ *Nouveau Journal Asiatique*, Tome X, Paris 1832, p. 322, and *Lettres édifiantes*, Paris 1843, Tome IV, p. 60.

² *Vide* Vol. III, p. 25.

Klaproth forgets GRUEBER and DORVILLE, though they travelled in the opposite direction.

After a long stay in China, van de Putte returned to Lhasa, once more crossing the Tang-la System and travelling: door seer bergagtige landen, welker namen onze geografische kaarten niet particulariseeren.

On the back side of his little map of Tibet he has written: »Lhasa p^o. Maio 1737. Dopo aver fatto il viaggio per Lhoka vedo dai luoghi passati che questa carta è molto erronea.» Thus, he was back in May 1737. In the same year he returned to India, where he is said to have witnessed the occupation of Delhi by Nadir Shah of Persia. In the letter quoted above he says: »over bovengedagte hoofdplaats Lhasa, voorbij de oorsprongen der wijdvermaarde Ganges en Indusstroomen, door't lustig Kasimir, Klijn Guzarat en Lahor na Hindostan.»

It seems from this passage as if he had taken his way over Manasarovar, Ladak and Kashmir. If this be true he would be the second European who had visited the Sacred Lake.

In 1743 he sailed from Bengal to Batavia and Malakka, and thence again to Batavia. August 15th, 1745, he again was in Batavia, where he died on September 27th and was buried in the Portuguese cemetery. In his last will he determined that all his annotations should be burnt, probably because they were not in a state to be brought in order and published by anybody except himself. Thus his precious journal, written in Dutch and Italian, and partly on small scraps of paper, got lost for geography. And the loss is the greater as it is clear from the little that is left of his hand, that he was a very intelligent and learned man, who had his eyes open in every direction and observed all he saw. The little that remains of van de Putte's collection, annotations and maps, is still in the museum at Middelburg.

Sir CLEMENTS MARKHAM says of him: »The premature death of this illustrious traveller is the more to be lamented because his vast knowledge died with him....» Speaking of the remains he adds: »There are also a few geographical notes, with slight sketches of the form of several lakes. On the notes there are frequent references to the journal, which has most unfortunately been destroyed. The great Dutch traveller is said to have been considered almost as a saint by his acquaintances in Tibet, and in the East generally, on account of the purity of his life; and he is praised for his great proficiency in several Oriental languages.»¹

Sir HENRY YULE says: »The journal of Samuel van de Putte, a Dutchman who in the time of the Emperor Yung-Ching reached Lhása from India, acquired the

¹ *Narratives of the Mission of George Bogle to Tibet, and of the Journey of Thomas Manning to Lhasa.* Second edition, London 1879, p. LXII et seq.

language and the friendship of the Lamas, and accompanied a deputation of them to Peking, was never published, and appears to have perished.»¹

By his great earnestness and modesty, his deep knowledge and intelligence, and by the determination with which he carried out his magnificent and difficult projects, van de Putte reminds us of ALEXANDER CSOMA KÖRÖSI. The regions of eastern Tibet he was the first to cross after GRUEBER and DORVILLE, are comparatively well known in our days, particularly by the exploration of PRSHEVALSKIY and ROCKHILL. The regions explored by POTANIN, KOZLOFF, FILCHNER and TAFEL are situated farther east. But from a historical point of view, it is still a great pity that his material has been lost. It would have been a very interesting task for a scholar to try to put together his scraps of paper like a gigantic puzzle map. He was too conscientious to confide his fragmentary material to anybody else, and, therefore, preferred to have it all burnt.

As I have pointed out before,² DELLA PENNA'S description of the road from Lhasa to Koko-nor and Sining, is taken directly from the information he got of van de Putte. On the other hand, Della Penna's general description of the nature, climate and mountains of Tibet is, no doubt, the result of his own observations. The following passage of his, is especially worthy of being remembered.

Il regno del Thibet è tutto montuoso e tra le montagne vi sono delle pianure, dove sono fabbricate città e terre, e castelli nella parte che riguarda il mezzogiorno, vicino alle quali piantano alcune selvette di salci ed albucci non essendovi per le montagne nè pur uno sterpo, non che arboscello. Verso poi mezzogiorno, che sono le provincie di Takpò, Kombò, e K'ham, vi sono delle selve, ma nelle provincie di Ngari, Tzang, U e Ciang in tutte quelle montagne non vi è pur un arboscello, ma solo alcuni arbori, e ben pochi per far travi travicelli per le fabbriche delle case vicino a luoghi habitati, come si disse servendosi di soli rami per il fuoco, quali si vendono a carissimo prezzo brugiandosi comunemente da tutti sterco di cavalli, bovi ed altri animali. Il clima è freddissimo, e tutto l'anno le cime de' monti sono piene di neve, e ciò procede dalla grand' altezza della terra, e per i grandi venti rigidissimi, che regnano in quel paese, che perciò il terreno per sopra circa sei mesi dell' anno resta come un duro macigno, e dove domina simil rigidezza d'aria e durezza di terreno non vi è alcun animale velenoso.³

In these few words della Penna has given a very good description of the nature of Tibet.

¹ *Cathay and the way thither*. Vol. II. London MDCCCXIII, p. 249.

² Vol. III, p. 25.

³ KLAPROTH: *Breve notisia del regno del Thibet* . . . *Nouveau Journal asiatique*. Tome XIV. Paris MDCCCXXXIV, p. 273.

CHAPTER X.

DEGUIGNES AND GEORGI.

As an example of the knowledge of Asiatic orography in the middle of the 18th century, I may quote here some extracts from DEGUIGNES, which in several respects are remarkable. In his description, as, for instance, on the map of STRAHLENBERG, only the eastern parts of Tibet exist, not the western. He says of it:¹ Ce royaume est ce que nous appellons précisément le Tibet, ou le Boutan, que l'on distingue en grand & petit Tibet. C'est un pays plein de montagnes, où peu de voyageurs ont pénétré. Les Chinois le nomment Tou-fan ou Si-tchang.... Lassa, autrement nommée Barantola, est la capitale de ce grand pays. But on the other hand, he includes under the expression »Tibetan nations« all those peoples who are living west of the provinces of Shen-si and Sze-chuan all the way to the sources of the Indus.

The great orographical features of High Asia he expresses in the following words, and with a perspicacity and intelligence which hardly had occurred before his time: Au nord des sources du Ganges, il s'élève une chaîne de montagnes qui va gagner Khoten, Yerken et Kaschgar, courant au nord & à l'ouest. A Kaschghar, elle tourne vers le nord-est & va jusqu'à la rivière d'Ili qu'elle suit en remontant au nord. C'est là ce que Ptolémée appelle le mont Imaüs, par lequel il divise la Scythie en deux parties.²

With the knowledge existing at the middle of the 18th century, an erudite scholar who tried to combine recent information with the geography of PTOLEMY, could hardly arrive at any other conclusion. As so many cartographers of this period and before this time, DEGUIGNES believes that only one single mountain range exists between India and Little Bokharia. This range, in which the sources of the Ganges are situated, turns to the north and west, and has Khotan, Yarkand and Kashgar at its northern base. From Kashgar it turns to the N. E. and north and is identified as the meridional Imaus of Ptolemy.

¹ *Histoire générale des Huns*. Paris 1756. Tome I, partie I, p. 163.

² *Op. cit.*, p. II.

However, he does not believe in such a simple arrangement, and begins, in the sequel, to subdivide the great range into several ranges:

Cette grande chaîne de montagnes a porté différens noms, & elle est formée de plusieurs montagnes que quelques auteurs regardent comme fort différentes les unes des autres, & dont ils ont formé la chaîne ou le cours fort différemment. On vient de voir celle de Ptolémée. Les Chinois font, des montagnes qui sont depuis Hami jusqu' à Kaschgar, une seule chaîne, & une autre depuis Kaschgar jusqu'au nord de l'Inde. La première porte chez eux le nom 1^o de Tien-chan ou Montagne céleste 2^o. Sioue-chan ou Montagne de neige, parce qu'en plusieurs endroits elle en étoit couverte. Mais ce dernier nom s'étend encore à la seconde chaîne qui court depuis Kaschgar jusqu'aux Indes. Les Tartares appellent aussi ces montagnes Mus-tag qui à la même signification que Sioue-chan. Tag signifie une montagne, & Mus de la neige. C'est de là sans doute que le nom d'Imaüs a été formé; Cependant on pourroit le rapporter encore à celui d'Imeïa; c'est ainsi que les Indiens appellent les montagnes qui sont au nord du Ganges & qui font partie de celle dont il s'agit La seconde chaîne de montagnes est appelée par les Chinois Tçong-ling & Sioue-chan. Celle-ci continue vers l'Est tout le long du Nord de l'Inde jusqu' à la Chine, & laisse appercevoir un terrain au nord qui est renfermé comme dans un cercle. Différens rameaux de cette montagne vont se perdre dans les Indes.

According to this opinion it is a question, not of one single range, but of a system composed of several ranges or mountains, regarding which different authors maintain different views. Deguignes is wise enough to consult the Chinese for more reliable information, and arrives at the conclusion that the range stretching from Hami to Kashgar is the Chinese Tian-shan. The second range, Sioue-chan or Snow mountains, which the Tartars call Mus-tag, stretches from Kashgar to India. According to Deguignes the name Sioue-chan also includes the first-mentioned range between Kashgar and India, and, therefore, he approaches the reality so near as to place a double range in western Tibet. He has also located the Mus-tag of STRAHLENBERG fairly correctly, as if he had a presentiment of the existence of the Kara-korum System. As a matter of fact, he does not know the latter. But the use of the name Mus-tag in the regions between Kashgar and India is always a step in the right direction.

It is also worth noting that Deguignes uses the Name Imeïa for the mountains north of the Ganges. His Imeïa is nothing else than a corrupted spelling of the name Himalaya. This was in 1756. It would, however, still take some time before the Imeïa was formed into Imelaïa and Himalaya. In *An Account of the Kingdom of Caubul*, MOUNTSTUART ELPHINSTONE wrote Hemalleh Mountains in 1815. FRANCIS HAMILTON, in *An Account of the Kingdom of Nepal*, 1819, has the terms Himachul, Himadri, Himaleh, Himalichul, Himaliya, »also called Humla, the Emodus of the ancients«. In 1820 JAMES B. FRASER wrote Himālā in his *Journal of a Tour through part of the Snowy Range of the Himālā Mountains*.

The last news Deguignes got from Tartary made it evident to him that the orography was still more complicated, and that the backbone range of which he had

spoken in the beginning of his Introduction, was accompanied by several ramifications stretching through the whole of Asia:

Depuis les nouvelles connoissances que nous avons eues de la Tartarie, nous y avons apperçu plusieurs autres chaînes de montagnes très-étendues qui se joignent à celle dont je viens de parler, qui en sont comme des rameaux & qui coupent l'Asie d'occident en orient, en faisant plusieurs grandes sinuosités. Vers Kashgar, le mont Imaüs ou la montagne du ciel continue son cours directement à l'ouest, & ensuite au nord-ouest, en serpentant le long du fleuve Sirr ou Jaxartes jusques vers Tharaz. Du côté de l'orient, c'est-à-dire à Hami, la même montagne va gagner les frontieres de la Chine....

His general view of the framework or skeleton of the continent of Asia is brilliant. No professional geographer of the time had been able to construct the principal features of the building in a more magnificent and correct way than Deguignes. In this connection he also correctly describes the Kwen-lun System, though he does not mention that name:

Telle est la vaste charpente qui soutient la plus grande partie de l'Asie. A ces chaînes & surtout à celles du midi, c'est-à-dire à la montagne du ciel, depuis Caschgar jusqu'à Hami, & ensuite plus au midi encore, c'est-à-dire à la chaîne qui va depuis Khoten jusqu'à la Chine, & qui sert à renfermer toute la petite Bukharie comme dans un cercle, tous les grands terrains sont comme suspendus, et s'abaissent à mesure qu'ils s'éloignent de ce centre, qui est comme la voûte et la partie la plus élevée de tout l'édifice. Delà part une grande quantité de fleuves qui sont entraînés en différens sens, selon la pente des terres, les uns du côté du midi, comme l'Indus & le Ganges qui vont se rendre dans la mer des Indes; les autres coulent vers l'occident; ceux-ci sont le Gihon & le Sihon qui se jettent dans la mer Caspienne. L'Obi, la Jenisea, le Selinga, la Lena se précipitent vers le nord, & se déchargent dans la mer septentrionale. L'Amour, le Hoam-ho & le Kiam, après un long cours vont se rendre dans la mer orientale. Tous ces grands fleuves partent de la ceinture qui environne le terrain compris entre Caschgar & la Chine d'un côté, le Tibet & la Tartarie proprement dite de l'autre. On lui a donné dans les derniers tems le nom de petite Bukharie.

He has a very clear conception of the general Asiatic hydrography, and he also knows that in the centre of High Asia there is a depression, Little Bukharia or Eastern Turkestan, surrounded by a circle of mountains. When he says:¹ C'est dans ce lac (Lop) que viennent se jeter les fleuves qui ont leur source dans la montagne Tçung-ling près D'Yu-tien, ce qui prouve, pour le dire en passant, que ce dernier pays est Khoten, d'où effectivement partent des fleuves qui viennent se jeter dans le lac de Lop.... he proves that he places the Chinese Ts'ung-ling to the west and S. W. of Eastern Turkestan.

From Chinese sources Deguignes has found that the kingdom of Yu-tien (Khotan) was situated to the east of a mountain called Ts'ung-ling. Les fleuves qui en sortent et qui coulent à l'Est, vont se rendre dans le lac de Lop; ceux qui coulent à l'Ouest se jettent dans la mer Caspienne. But here again he has a feeling

¹ Op. cit., p. XI.

of a more complicated arrangement: Selon tous les Géographes Chinois, ce pays (Khotan) confine du côté midi avec des peuples du Tibet appelés No-kiang.... that is to say: there *is* a Tibetan country south of Khotan. And further: On nomme deux montagnes principales dans le pays de Khoten. La première O-neouta-chan ou Kuen-lun-chan, d'où les anciens Chinois croyoient que le Hoam-ho tiroit sa source. La seconde appelée Tçung-ling située au Sud-ouest du pays.

The situation of Ts'ung-ling is made still more precise in the following words:¹ Du côté de l'occident, ce pays (Kashgar) est borné par la montagne Tçung-ling, qui regne depuis Khoten jusqu'à Kaschgar. La capitale ou Kaschgar est a la distance de 100 li de cette montagne, qui porte aussi le nom de Sioue-chan & de Pe-chan. But he complicates the question by saying that Aksu is south of Sioue-chan or Pe-chan. And the situation becomes still more complicated when he says:² Ptolémée donne pour limites à la Scythie au-delà de l'Imaüs, du côté de l'Occident, cette chaîne de montagne qu'il appelle Imaüs et qui répond à celle que les Chinois nomment Tçung-ling vers Khoten et Kaschgar; Tien-chan, Sioue-chan & les Tartares Mustag vers Aksou. Au Nord sont des pays inconnus, a l'Orient la Serique & au Midi l'Inde au-de-là du Ganges, ce qui est très-juste; ce fleuve prenant sa source dans les montagnes qui sont au Midi de Khoten, où commence la montagne de Tçung-ling qui sépare les deux Scythies.

And at another place³ he directly says that Emodi Montes are the same as those which the Chinese call Tçung-ling and which are near Khoten.

But in his introduction he maintains: Les Emodi Montes qui terminent du côté de l'Occident la partie méridionale de la Scythie sont des branches du Tçung-ling, appelées en cet endroit par les Indiens Imeïa.

This is a contradiction, for in one case he identifies the Emodi Montes with the Ts'ung-ling near Khotan, and in the other he says the Emodi Montes are ramifications from the Ts'ung-ling and identical with the Imeïa, or Himalaya, of the Indians. This uncertainty at some places is easy to explain. The signification Ts'ung-ling has, as we shall see in Vol. VIII, a very wide sense, and the name of Emodi Montes belongs only to the Himalaya. Deguignes was quite right in consulting the whole material existing: the ancient knowledge, the geography of the Chinese and the recent information. His attempts to bring all these notions into harmony with one another proved to be a very difficult task at some points, but he understood that he could not write his *Histoire générale des Huns, des Turcs, des Mogols, et des autres Tartares occidentaux*, without a solid geographical foundation. And

¹ *Ibidem* p. XXI.

² *Ibidem* p. XXXIX.

³ *Ibidem* p. 112.

therefore, the results of his efforts are superior to everything else on this question in the middle of the 18th century.

In his confused work on Tibet, GEORGI makes an attempt to describe the situation of Kashgar in relation to Imaus, Indus, Ganges and Brahmaputra, and to bring DEGUIGNES' view in harmony with DELLA PENNA'S. He says:¹

Kaschgar autem, seu Caskar, id est interprete D. De Guignes, Casia Regio utramque Scythiam citra & ultra Imaum dividens, ea est unde originem inter cetera ducunt flumina quatuor Indus & Ganges ad Austrum: ad Occasum Gihon (ut Arabes loquuntur), & Sihon. P. Horatius Pinnabilensis lacum describit in Provincia Tibetana Ngari ad confinia Cascar, ex quo testantur Indigenae flumina quatuor exoriri, Indum nimirum Gangem, & Tzhang-pò sive Tzhang-ciù, aut etiam Tsangia dictum.

Of Ganges he adds:

De quarto id unum memorat, quòd cursum vergat in Tartarorum terras.

According to this statement the Ganges should have its sources in Tartary, and the enormous mountain barriers of Tibet do not seem to interfere with this belief.

Regarding the great mountain ranges, he again quotes Deguignes:² Imaus Sinice Tien-chan, & veteri Hunnorum lingua Ki-lien, sive Ki-lo-man, hoc est interprete D. De Guignes, Mons Caelestis nuncupatus; & ipsi cum primis fontes sacri fluminis Gangis ad hanc opinionem concipiendam incolas Caskar inducere potuerunt.

Or in other words. Mons Imaus is identical with Tien-shan, and in Tien-shan the sources of the Ganges are situated. If we compare this curious view with STRAHLENBERG'S map published some 30 years before the *Alphabetum Tibetanum*, we cannot say that Father GEORGI was up to date. He simply lets the meridional Ganges run straight across the whole Tarim System of Eastern Turkestan.

Of Ladak and Ngari he has the following conception:³ Regnum Latà sive Ladak conterminum ab Occasu, Casimiriis, & Mogulensibus: Ab Ortu Ngari: a Septentrione, Tartariae, qua spectat Vsbekios. The three provinces of Ngari are all bordering upon Tartary to the north. Ngari Sangkar habet, ad Oc. Ladak: ad S. Caschar, & Tartariam: ad Or. Ngari Purang: ad M. Mogol. Ngari Purang, ad Oc. aestivum adhaeret Ngari Sang-kar, ad S. Tartaris: ad Or. Ngari Tamò: ad M. Mogol. Ngari Tamò, ad Oc. adjacet Ngari Purang: ad S. Tartaris: ad Or. Provinciae Tzhang: ad M. iterum Mogol. The three provinces of Ngari thus represented the whole breadth of western Tibet, so far as it was known. The immense wastes of Central and Northern Tibet were still practically unknown. Therefore, the Kara-korum Mountains disappear altogether.

The road from Lhasa to Koko-nor, Georgi describes in the following words:⁴

¹ Frater Augustinus Antonius Georgi: *Alphabetum Tibetanum*. Romae MDCCLXII, p. 343.

² Op. cit., p. 344.

³ Op. cit., p. 417.

⁴ Op. cit., p. 422.

Damna, quae inter Civitates Sericae a Ptol. numeratur eadem esse videtur ac Dam, unde nomen accepit Ducatus Dam in hac Provincia situs. Praeter aedem Regiam ac Nobilissimam Ducis, nullae sunt domus. Habitant Populi in tentoriis, partem maximam Tartari, reliqui Tibetani. Dam octiduum distat a Lhassa. Post Dam, biduo pervenis Nak-cihukha ad arcem quidem ultimam, sed non ad ultimos Tibetanorum fines. Inde enim per longum iter dierum quadraginta nulla amplius aedificia extant, sed sola tentoria obvia habent Viatores. Incolae omnes sunt Nomades, interque armenta Jak, Boves nimirum sylvestres ingenti numero pascunt. Lacte, Butyro, bubulis ovillisque carnibus nutriuntur; aliudque nullum est ciborum genus, quam hoc unum, quod offerant peregrinis. Die quadragesimo ad Bicihu venies. Bicihu fluvius est maximus, quem trajicies navi devectus constructa pellibus. Quum diem integrum navigaveris stationem tenebis nocta in Insula ejus fluvii exigua. Inde rursus diluculo solvens sub meridiem in littore stabis. Ad ripas fluminis tibi spectanda statim objicitur Gens alia Nomadum frequentissima. Hinc Zolomam absoluto itinere mensis pervenies. Zoloma vero discedens eris die quinto in Coconor, ad fines Septentrionales Provinciae Kiang Tibetanorum. Hanc esse puto, quam Tangut appellant.

This is Georgi's version of della Penna's description of the road. But Georgi has not improved the original text.¹ Bicihu is della Penna's Bic'iù, the Bri-chu or Mur-ussu, Zoloma is Gurban Solom gol, according to KLAPROTH,² though this itinerary, which, as we have seen, is at least partly, derived from communications given by VAN DE PUTTE, crosses some of the highest and most inhospitable mountain systems on the earth, the description does not contain a word about mountain ranges, glaciers or summits with eternal snow. It is not mentioned that the pilgrims and »viatores» before reaching the »Bicihu», had to cross the immense mountain-masses of Tang-la, where Pater HUC had such great difficulties to overcome more than a hundred years later.

Georgi makes an attempt to identify the Kambalà with the mountain ranges of the classical authors and of PTOLEMY.³ The most interesting passage in this connection is the one dealing with the view to the north from Kambalà, quoted in Vol. III. E vertice Kambalà prospicitur nova quaedam series elatiorum, nivorumque montium ad Boream. Hinc eos adorant Indi ac Tibetani viatores. At another place, p. 348, Georgi identifies these mountains with Ptolemy's Casii montes and destroys, as usual, the original meaning of the missionaries. Magna deinde est erga montes Casii, sive Kusii Indorum ac Tibetanorum Religio. Ubi vertices eorum montium nive albentes e longinquo conspexerint, flexis continuo genibus, & nudato capite, sacras illas, ut putant, Numinis sedes adorant. The mountains visible to the north from Kambalà, are Transhimalaya, and not the Casii montes. By identifying the two with one another, Georgi again removes the greater part of Central and Northern Tibet, though he ought to have remembered that the road from Lhasa to Koko-nor

¹ Cp. Vol. III, p. 25, where I have given della Penna's text.

² *Nouveau Journal asiatique*, Tome XIV, Paris 1834, p. 177 et seq.

³ Op. cit., p. 452.

demanded a very considerable space. The adoration of the natives on the top of Kambalâ, was probably of local importance only; this supposition becomes strengthened if we compare Georgi's version with the original description of BELIGATTI (Vol. III, p. 20 *supra*).

Having mentioned the division of Tibet in the upper, the middle and the lower, he says:¹

Itaque superius continet Ngari, ubi immania saxa, nudae rupes, & montes sunt nive perpetuo tecti, Caucasi appellati in itineribus Missionariorum tum Societ. Jesu, tum Ord. PP. Capuccinorum. Idemque Regnum Elephantorum Diis ipsis auctoribus nominatum scribunt. Elefantos enim, aliaque belluarum genera ea in regione antiquitus fuisse opinantur. In these immense rocks, barren cliffs and mountains covered with eternal snow, situated in Ngari and called Caucasi montes, we easily recognize the Kailas, the Gurla Mandata, the Kubi-gangri and the other giants of the region. And in the »Kingdom of Elephants« we at least partly recognize the Langchen-kabab or Elephant's mouth, as well as the mountains surrounding the source of the Satlej, or the Elephant's Mountains.

GEORGI'S work contains a good deal of important information, and touches upon many most interesting problems. He uses the very best sources of the time, as DELLA PENNA, BELIGATTI and probably other missionaries, and indirectly VAN DE PUTTE, as well as DEGUIGNES, but he has not always been able to digest the first hand material he has had at his disposal, and his work is, therefore, as a rule, very confused.

Speaking of Georgi, SYLVAIN-LÉVY calls his *Alphabetum Tibetanum* a »fatras polyglotte où la linguistique prend un air de grimoire, où la scolastique manie et fausse l'érudition. C'est dans ce pot-pourri déconcertant que se retrouvent un routier complet de Chandernagor à Lhasa par le Népal et nombre de détails, jetés au hasard de la controverse, touchant les divinités et le culte du Népal.»²

Sylvain-Lévy compares Georgi's and KIRCHER'S conception of the word Langur:

Les noms géographiques cités dans ces documents sont en général aisés à reconnaître. Le mont Langur, à quatre jours de Lhasa, désigne la longue série de chaînes qui se succèdent dans la direction de l'Ouest-Sud-Ouest à partir de la passe de Khamba (Kambala des Capucins) que l'itinéraire de Georgi place à trois jours de distance de Lhasa. Georgi, il est vrai, donne le nom de Lhangur à la première des hautes montagnes qui se rencontrent vers l'Est, en allant du Népal à Lhasa, à 50 mille pas de Kuti. Le désaccord n'est qu'apparent; car Langur est un nom générique qui signifie, en langue parbatiya, 'une chaîne de montagnes'. En abordant les hauts massifs qui se dressent entre Kuti et Lhasa, Jésuites et Capucins ont entendu aux extrémités opposées le même cri sortir de la bouche

¹ Op. cit., p. 454.

² *Le Népal, étude historique d'un royaume hindou*. Vol. I, Paris 1905, p. 117.

de leur guide: Langur! 'La montagne!' Ainsi, tandis que le Langur de Grueber est le Khamba-la, le Langur de Georgi est le Thang-la ou Nya-nyam-thang-la.

Most critics of Georgi's work have expressed themselves in rather sharp terms. In his article *Le Thibet et les études thibétaines*, TH. PAVIE says:

L'Alphabetum thibetanum d'Horace della Penna, ouvrage précieux pour son temps et qui renferme un peu de tout, avait été singulièrement gâté par l'érudition indigeste de l'éditeur Georgi.¹

¹ *Revue des Deux Mondes*, Tome XIX, Paris 1847, p. 52.

CHAPTER XI.

ORME, DOW, DU HALDE, DE MAILLA, RENNELL, TIEFFENTHALER, WAHL, WILFORD, AND OTHERS.

When ROBERT ORME, in about 1760, wrote his history of British transactions in India,¹ he felt, as DEGUIGNES, the necessity of creating a geographical foundation or a description of the scene where these transactions so far had taken place.

In his introduction he speaks of the Kailas and of the presumed sources of the Ganges, and here we easily recognize the mistakes originally made by the Lama-Surveyors:

At the foot of the mountains called Kentassi, in the country of Thibet, and in that part of them which lays between the thirty-first and thirty-second degree of latitude and between the ninety-eighth and the hundredth degree of longitude, the Ganges, formed from several sources, passes successively two great lakes, and flows to the west until the opposition of a part of the Indian Caucasus turns it to the south, and soon after to the south-east, when at length, flowing due south, and having completed in these various directions a course of two hundred leagues, it enters India by forcing its passage through the mountains of the frontier.

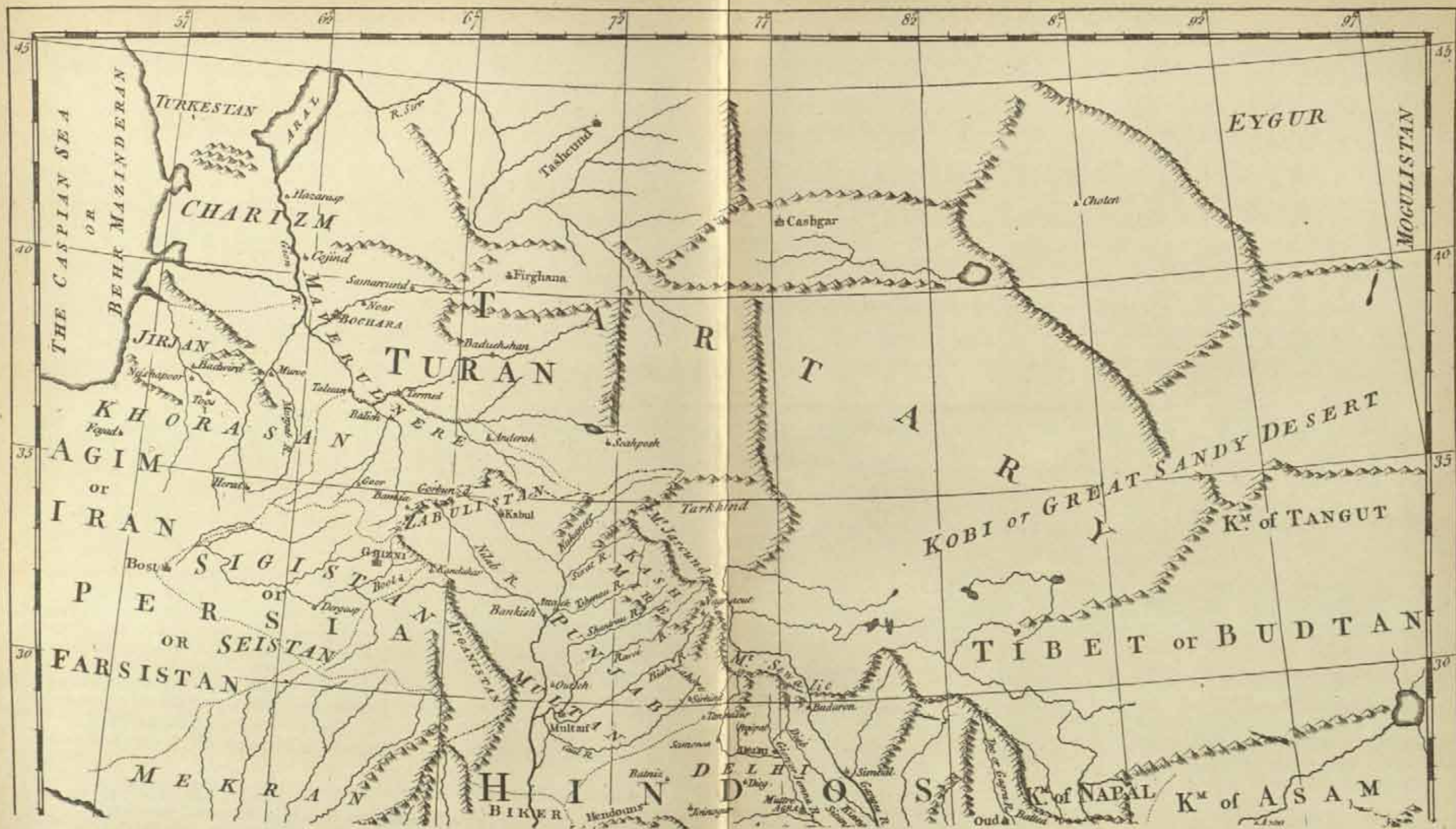
ORME is not nearly so clear-sighted as DEGUIGNES. In another work of his we only find the following passages regarding the mountains north of India.²

That part of the western side of Indostan which is not bounded by the sea, is separated from Persia and the Usbeg Tartary by desarts, and by those mountains which were known to the ancients under the name of Paropamisus. The course of mount Caucasus forms its barrier to the north, and separates it from various nations of Tartars, from the Great and Little Thibet. Where mount Caucasus ceases, marshes and rivers divide it from the kingdoms of Tepra, Assam, and Aracan, and circumscribe to the eastward the dominions of the Mogul, until they reach the sea at Chitigan.

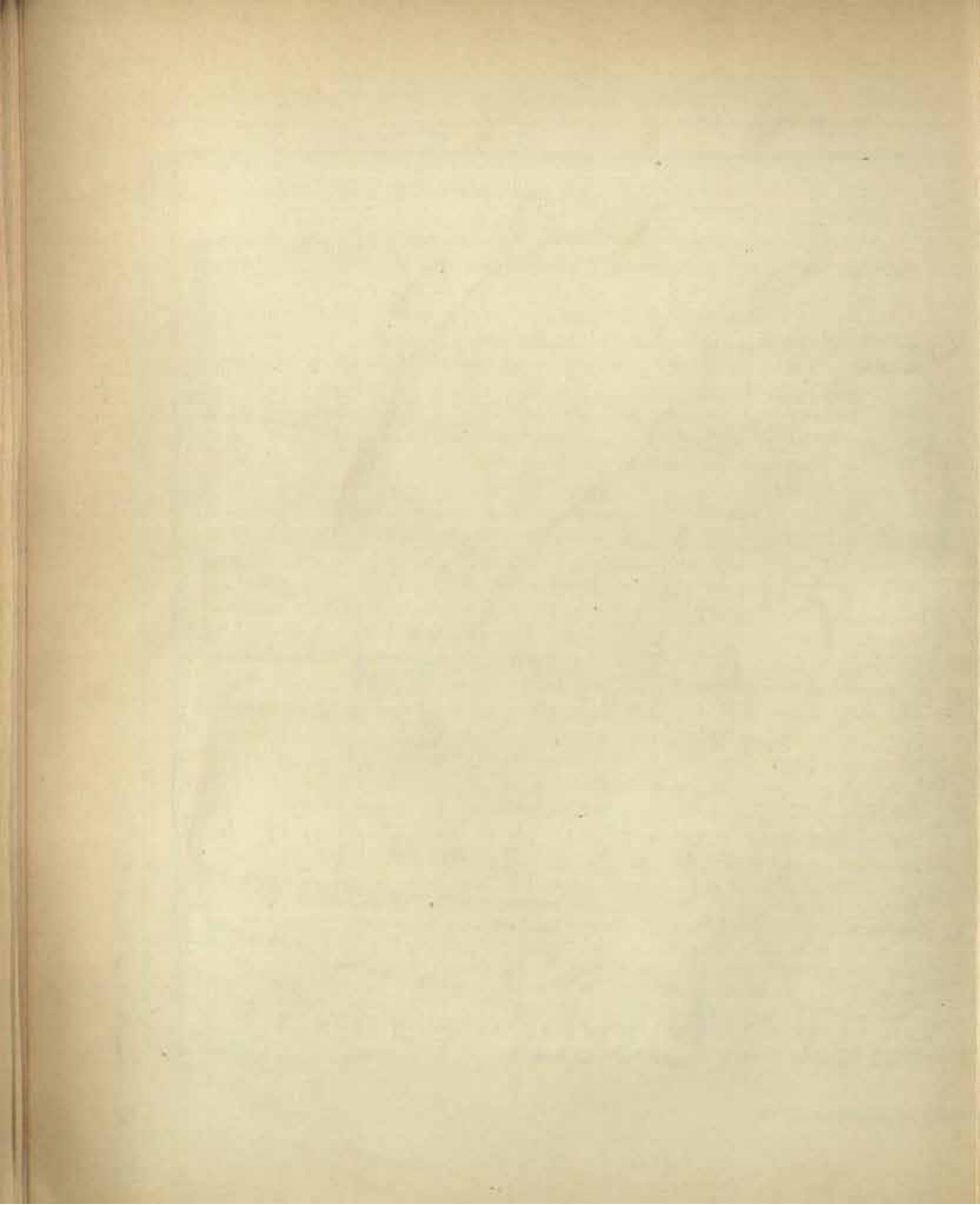
In the following passage he seems to regard mount Caucasus as bordering the plains of Tartary to the south, disregarding the immense highlands of Tibet: »The

¹ Robert Orme: *A History of the Military Transactions of the British Nation in Indostan from the year MDCCXLV.* London, MDCCCLXIII, Vol. 1, p. 14.

² Robert Orme: *Historical Fragments of the Mogul Empire, of the Morattoes, and of the English Concerns in Indostan; from the year MDCLIX, etc.* London, MDCCCV, p. 457 and 462.



Alexander Dow: A General Map of Hindostan, 1768.



northern winds, after having scoured the vast plains of Tartary, receive additional keenness in their passage over the summits of mount Caucasus, covered with eternal snows: They bring intense cold into the countries which lay at the foot of these mountains....»

The map illustrating ROBERT ORME'S work, gives an idea of his conception regarding the country to the north of India.¹ A very sharply defined range or wall of mountains forms the northern boundary of Hindustan. On the S. W. side of its western part, is Kasmire. North of its eastern part is Tibet or Budtan. North of its western part is Tartary. Between the two, Kobi or Great Sandy Desert comes in and reaches to the presumed sources of the Ganges. The rest of the country north of India has been left blank.

The same map also accompanies ALEXANDER DOW'S translation of FERISHTA, 1768.² The single difference is that it has some scanty detail added to the north of the defined boundary range. But these additions do not improve the map. Nagracut, where an image was worshipped still in 1768 is entered as the name of a place, not of a mountain. The Himalayan boundary range is called Mt. Sewalic. Kash Mire is on the S. W. side of Mt. Jarcund. Yarkand is thus regarded as a mountain range and not as a town. N. E. of this range is Tarkhind, marked as a territory surrounded by mountains on all sides. The Upper Indus, which was so well conceived by MONSERRATE in 1581, does not exist at all. A meridional mountain range, the last remains of PTOLEMY'S meridional Imaus, starts from the neighbourhood of Nagracut and reaches a latitudinal range, representing the Kwen-lun. Cashgar and Chotan constitute two self-contained basins. Pl. XII is a reproduction of the northern half of this map. It is surprising that any mapmaker could draw such a fantastic representation of these parts of Asia 38 and 35 years after the publication of the excellent maps of STRAHLENBERG and D'ANVILLE.

When Ferishta speaks of hostile invasions in India from the north, Dow, in his notes, is not able to tell which regions and roads are meant, and even in our days it would be difficult to do it. In Ferishta we find, for instance, the following description of an invasion:³

In the beginning of the year 409 (A. D. 1018), as soon as the sun began to awake the children of the spring, Sultan Mamood, with a hundred thousand chosen horse, and thirty thousand foot, raised in the countries of Turkistan, Maverulnere, Chorrassan, and the adjacent provinces, undertook an expedition against Kinnoge, which from the time of Gustasp to this period, had not been visited by any foreign enemy. Kinnoge was distant from Ghizni three months march, and seven great rivers rushed across the way. When Mamood reached the confines of Cashmire, the Raja sent him presents of every thing

¹ *A General Map of Indostan or the Great Mogol's Empire with the Adjacent Countries . . .*

² *History of Hindostan by Mahummed Casim Ferishta of Delhi.* Vol. I, London, MDCCLXVIII.

³ Op. cit., p. 71.

curious and valuable in his country, and waited to have the honour of expressing his loyalty. When the Sultan, with much difficulty, had conducted his army through the mountains, he entered the plains of Hindostan, drove all opposition before him, and advanced to Kinnoge.

Dow says in a note to this: »Mamood's route lay through the mountains behind Cashmire; and he must have entered Hindostan by way of Tibet.»

Ferishta has not given any hint of the way. The mountains behind Kashmir are, according to the map in Dow's work, Mt. Jarcund. If Mahmud entered India by these mountains and Tibet, we must think of the ordinary Kara-korum route. The question is only whether Tibet is meant as Ladak or as Great Tibet. The latter seems to be the case in the following passage of Ferishta; »In the year 642 (A. D. 1244), an army of Mogul Tartars made an incursion into Bengal by way of Chitta and Tibet...»¹

In the great work of DU HALDE on China and its western dependencies, we find, at the end of the last volume, some information on Tibet, gathered by the Jesuit missionaries in China. There the opinion is expressed that the name Tangouth or Tangut, signifies, generally, all the countries from Koko-nor to the source of the Ganges, that is to say, not only Tibet, »mais encore les larges plaines et tous les déserts qui sont à son Nord & à son Ouest, qu'on trouve dans la carte bordez par des chaines de montagnes. On voit là encore maintenant des Tartares avec leurs troupeaux & leurs tentes.»² These *plains* north and west of Tibet Proper are situated exactly where we, in reality, have the Kara-korum System.

In the beginning of the same volume, p. 44 *et seq.*, we find some information regarding Tibet in general, and the source of the Yellow River in particular:

J'ai appris d'un ancien Président du Tribunal des Rits de Peking, qui a été autrefois Ambassadeur vers le Grand Lama, tout ce que je dis ici du Thibet, & ce qu'il m'a dit, s'accorde parfaitement avec ce que m'en ont rapporté plusieurs autres Mandarins, qui y ont été envoyez plusieurs fois ces dernières années.

Ce Président m'a assuré qu'il n'y avoit pas plus de 400. lieues depuis Si ning jusqu'à Poutala, & qu'il avoit fait le voyage en 46. jours durant l'Hyver, ne faisant guères plus de 8. ou 9. lieues par jour; il m'a ajouté qu'il avoit trouvé des habitations presque partout. Il employa 20. jours à aller jusqu'à un lieu nommé Tsing sou hai par les Chinois. C'est un Lac ou plutôt ce sont trois Lacs si près les uns des autres qu'il n'en font qu'un.

C'est là qu'est la source du Fleuve jaune appelé en Chinois Hoang ho, qui dans cet endroit n'est qu'une petite Rivière d'une eau fort claire. Elle prend d'abord son cours vers le Sud, entre des montagnes dont elle reçoit les eaux, & après s'être grossie de celle des ruisseaux, & des petites Rivières qui coulent de tout le pays de Coconor, elle entre dans la Chine....

Ce Mandarin m'ajouta que depuis Si ning jusqu'aux frontieres du Royaume de Thibet, les terres vont toujours en s'élevant d'une maniere sensible, & qu'ordinairement les montagnes

¹ Op. cit., p. 191.

² *Description de l'Empire de la Chine et de Tartarie Chinoise.* Paris, MDCCLXX, Vol. IV, p. 463.

qu'on grimpe en allant, lesquelles sont en grand nombre ont beaucoup plus d'élévation sur le terrain qui est à l'Orient du Côté de la Chine, que sur celui qui est à l'Occident du côté du Thibet.

A la vérité il faut que ces petites montagnes, où la petite Rivière d'Altangkol prend sa source, soient extrêmement élevées au-dessus du niveau de la Mer, puisque cette Rivière qui est assez rapide va se jeter dans les Lacs de Tsing sou haï, & que le Fleuve Hoang ho qui sort de ces Lacs à environ cent lieues d'un cours fort rapide, jusqu'à son embouchûre dans la Mer Orientale de la Chine: quand on commence à entrer dans le Thibet, le terrain va en baissant, & le climat, y est aussi beaucoup plus tempéré.

From Si-ning to Potala thus a 46 days' journey was reckoned, including the passage of Tang-la, and more or less the same road that had been taken by GRUEBER, DORVILLE and VAN DE PUTTE, and in later years was followed by HUC and GABET, and, partly, by PRSHEVALSKIY and ROCKHILL. The statement of the existence of habitations nearly everywhere is, of course, exaggerated. From Si-ning to the source of the Hwang-ho, a journey of 20 days is estimated. The general view regarding the altitudes is interesting. From Si-ning to the boundaries of Tibet, *i. e.* the country south of the Tang-la, the ground is said to rise sensibly the whole way. There are a large number of mountains. The N. E. slopes facing towards China are much steeper than the S. W., facing towards Tibet. Altan-gol, which is regarded as the source river of Hwang-ho, is correctly supposed to be situated at a considerable height. At the entrance of Tibet the ground begins to fall, which is indeed the case, as also HUC has pointed out in his *Souvenirs*. Tibet Proper is reckoned as beginning south of Tang-la, and Nakchu is the first place one comes to. As compared with the inhospitable climate of Tang-la, the air may indeed be said to be warm and agreeable in the country farther south.¹

¹ DU HALDE and the maps of D'ANVILLE accompanying his great work on China, were criticised by DE MAILLA, the author of the General History of China, published by Abbé GROSIER. In a letter to Father COMBES, dated Peking, November 5th, 1738, de Mailla proves the incorrectness of the map of Tartary which was the first in the great work of Du Halde. D'Anville justified himself in letters to the Fathers in Peking, saying amongst other things: Il faut convenir que tout ceci n'est pas propre à justifier la carte générale de la Tartarie, sur le point dont il est question. J'aurai du moins en ceci la satisfaction de paroître ne me point entêter d'une première opinion. Dans la carte la plus générale, qui est la première dans l'ouvrage du P. Duhalde & qui a pourtant été dressée la dernière, j'ai remis la côte de Tartarie au point précisément où je l'ai trouvée dans la carte originale des R. R. P. P. Jésuites de la Chine. — *Histoire générale de la Chine ou Annales . . . traduites . . . par le feu Père Joseph-Anne-Marie de Moyriac de Mailla, publiées par M. l'Abbé Grosier*. Tome premier. Paris MDCCLXXVII. p. CLXXXVII.

To this DE MAILLA answers (*ibid.* p. CLXXXIX).

Le P. Duhalde vous a dit que nous avons pris l'alarme trop tôt, &c. Si nous ne l'avions pas prise alors, nous l'aurions prise en voyant cette carte dans l'ouvrage du P. Duhalde, avec toutes les fautes de géographie, qui sont les mêmes dans celle-ci, que dans celle qu'il dit n'être qu'un projet fort informe; même différence de longitude, de latitude, de rhombe, de vent & distance de cette carte avec les nôtres. Je pourrais bien, puisqu'il m'en prie, lui faire connoître dans son ouvrage des erreurs bien plus considérables & en si grand nombre que pour le rendre passable à gens instruits, il faudroit le refaire tout de nouveau. En Europe, on n'y aura pas regardé de si près. Si l'histoire de la Chine, que j'ai envoyée paroît un jour, on verra alors clairement que le P. du Halde en a parlé comme un aveugle des couleurs.

In de Mailla's work on China,¹ there is a description of the real source of the Hwang-ho, »Hotun-nor, & en Chinois Sing-sou-haï,» Mer semée d'étoiles, and its relation to the old Chinese Kwen-lun:

Toutes ces eaux, après avoir serpenté l'espace de cinq à sept ly, forment deux lacs appelés Alanor, d'où sort un ruisseau qui coule de l'ouest à l'est sous le nom de Tchi-ping-ho; Ce ruisseau recevant ensuite le Yélitchi, le Holan & le Yélitchou change de nom & prend celui de Hoang-ho qu'il garde jusqu'à son embouchure. A quelques dizaines de ly au-delà, il se sépare en sept à huit bras qui se réunissent à vingt journées de-là à la montagne Teneki-lita, en Chinois Koen-lun, qui fait partie des montagnes Siué-Chan, ainsi nommées de la neige dont elles sont couvertes, au lieu nommé Koti ou Kotsi au sud de Koen-lun. Ce canal traverse ensuite le pays de Alipiélitchir où il reçoit le petit Hoang-ho & le Kilimatchi coulant ensuite à l'ouest autour de la montagne Koen-lun, de-là par le nord-est à une vingtaine de journées de-là, il arrive à Tchi-ché & entre sur les terres de la Chine.

In Vol. XIII of the same work² there is a special chapter on Tibet, dealing, however, nearly exclusively with its history. Only at the beginning of the chapter, the geographical situation of the country is described thus:

Le Thibet est connu sous différents noms. Les Chinois l'appellent Tsang: les Tartares, Barantola, Boutan, Tangout. Les uns et les autres le désignent encore sous le nom de royaume de Lasa, parce que c'est dans le pays de Lasa que le Dalai-Lama tient sa cour. On donne à cette vaste contrée six cent quarante lieux d'étendue d'orient en occident, et six cent cinquante du nord au sud. Le Thibet est renfermé entre le Pays de Kokonor, les provinces de Se-tchuen et d'Yunnan, le royaume d'Ava, les états du Mogol, la Buckarie et le grand désert de Cobi.

In a later edition of the work there is a description of the climate, the products, etc. of Tibet.

La saison humide commence en juin et dure jusqu'au mois de septembre; les pluies sont alors abondantes et presque continues. Depuis le mois d'octobre jusqu'au mois de mars, l'air est pur, le ciel serein, et presque jamais obscurci d'aucun nuage Le Thibet, par sa position géographique, participe à l'élévation du plateau de la Tartarie et à la nature de son sol, imprégné de nitre La partie la plus occidentale du Thibet, laquelle s'étend jusqu'aux frontières des Etats du Mogol et de la province de Cachemire, est un pays peu connu, fort rude, et hérissé de montagnes presque impraticables. Les passages étroits qu'elles laissent entre elles ouvrent cependant l'entrée du Thibet à quelques voyageurs, qui venus de la Perse ou de l'Inde, ont assez de courage pour tenter cette route.

Here it is clearly stated that western Tibet is full of nearly impracticable mountains. They belong all to the Kara-korum System.³

In an article: *Nachrichten von Tybet, aus Erzählungen tangutischer Lamen unter den Selenginskischen Mongolen*, the following general characteristic is given of Tibet:⁴

¹ *Histoire générale de la Chine* Tome IX, p. 405.

² Paris 1785. Article IV. *Du Thibet*. P. 229—241.

³ *De la Chine, ou description générale de cet empire, rédigée d'après les mémoires de la mission de Pékin*. Troisième édition, par M. l'Abbé Grosier. Tome I, Paris 1818, p. 76.

⁴ *Neue Nordische Beyträge zur physikalischen und geographischen Erd- und Völkerbeschreibung, Naturgeschichte und Oekonomie*. Erster Band. St. Petersburg und Leipzig 1781, p. 202 a. 205.

The Mongols call it Tangut and Többet or Tybbet and Tebudun; the Tangut name is Begedu. Die Mongolen rechnen die tybetische Gegend (in Südwesten) von sich zur rechten Hand (Baroon-Tala) daher ist auch Baroon-tala eine gebräuchliche Benennung für Tybet im Gegensatz von Dsuun-Tala (der linken Hand) worunter die Wohnsitze der mandschurischen Stämme verstanden zu werden pflegen.

Die Hauptstadt des tangutischen Reichs ist Llassa oder Dsassa. Sie liegt an einem Strom Dsompcho-zu, auf mongolisch Dsam-murun, der mit einem andern Ui-murun vereinigt nach meinen Berichten gegen Süden fließen, und die Landschaft Dsompcho bewässern soll. Llassa liegt auf der linken Seite des Stroms, und die umliegende Landschaft wird nach einer Nachricht Bodbo genannt.

The Adjunct of the Imp. Russian Academy, HAKMANN, published, in 1783, an article on Tibet: *Nachrichten, betreffend die Erdbeschreibung, Geschichte und natürliche Beschaffenheit von Tybet*, which, according to PALLAS, however, only is a compilation from different printed material, DELLA PENNA, GEORGI, a. o.¹ In the north, Tibet borders upon the great sand desert of Shamo which separates it from Little Bukhary.

Tybet, ein weitläufiges Land, dessen Umfang nicht genau bekannt ist, besteht theils aus hohen Gebirgen, theils aus Ebenen und grossen Sandwüsten . . . Das nördliche Tybet, welches an Indostan gränzt, besteht ganz aus steilen Schneegebirgen, deren Seiten mit dicken Wäldern bedeckt sind. Diese Gebirge sind fast ganz unwegsam, oder haben nur schmale Wege, die oft an fürchterlichen Abgründen fortlaufen, in welche das Wasser von den hohen Bergen mit heftigem Getöse herabstürzt. Der südliche Theil von Tybet ist, in Vergleichung des erstern, einer hohen Ebne gleich, in der man hin und wieder niedrige Berge gewahr wird.

So reichlich viele Gegenden dieses Landes, besonders in dem nördlichen Theil, mit Waldungen versehen sind, so sehr leiden andere daran Mangel, und das südliche Tybet soll grösstentheils so von Holzung entblösst seyn, dass die Bewohner Viehmist brennen.

Nahe an den Wällen der Stadt (Lassa) fliesst der grosse Fluss, welcher in Bengalen Burampooter genannt wird. Dieser Fluss entspringt in den Kaschemirischen Gebirgen, fliesst durch das Königreich Assam, und tritt bey Rangamati in Bengalen ein, wo er sich nachher mit dem Ganges vereinigt. — Die Landschaft Hor liegt zwischen der Tartarey und den Tybetischen Provinzen Ngari und Kiang gleichsam in der Mitte. Die horischen Nomaden sind äusserst dumm. Ihr langes Haar tragen sie wie Stricke geflochten. In ihrer Kleidung und ganzen Lebensart gleichen sie den Tatarn, und sprechen auch besser tatarisch als tybetisch. Obgleich sie Tybet Unterthan sind, werden sie doch niemals zu Soldaten genommen, weil sie gemeiniglich zu den Tatarn, ihren Freunden übergehn.

Here northern Tibet is represented as bordering upon Hindustan. It consists exclusively of steep snowy mountains. Northern Tibet is said to be rich in forests, whilst the southern parts are barren. The Brahmaputra is said to have its origin in the Kashmirian Mountains. Between Tartary and Ngari, where in reality the Karakorum Mountains are to be found, the country Hor, with its population of nomads, is said to be situated, a view that kept its ground for nearly a hundred years.

At about the same time Major RENNELL regarded the mountains of Tibet and Tartary as the northern boundaries of Hindustan. The tract occupied by the course

¹ *Neue Nordische Beyträge*, Vierter Band, 1783, p. 271.

of the River Indus is bounded to the east by the mountains of Little Thibet and Sewalick; and on the north by the mountains, called Hindoo-Ko, which separate Cabul from Bucharia, in Tartary.

The river called by Europeans Indus, and by the natives generally Sinde (or Sindeh), is formed of about 10 principal streams which descend from the Persian and Tartarian mountains, on the north, east and north west. The Ayin Acbaree describes its source as being in Cashgur and Cashmere; by which it appears that the people of Hindoostan consider the north east branch as the Sinde.¹

Still so late as in 1785, the principal cartographer of India and surrounding regions, had not the faintest idea of the Kara-korum System, and uses the Ain-i-Akbari as a source. The natives of Assam informed Rennell »that the Burrampooter has a very long course previous to its entering Assam, and that it comes from the N. W. thro' the Thibet Mountains.« Of the country in general he says:²

By Thibet, or more properly Great Thibet, we are to understand all that vast country extending from the sources of the Indus to the borders of China; and from Hindoostan, to the great desert of Cobi, northward; though we have but a faint idea of its extent towards that quarter. Its length from east to west cannot be less than 1600 British miles: its breadth is very unequal. We are informed generally that it is divided into three parts; that is, Upper, Middle, and Lower Thibet. The upper division seems to respect the countries towards the sources of the Ganges and Sanpoo Rivers: the middle, that in which Lassa is situated, and of which it forms the centre: and the lower Thibet, that which borders on China. But the subject is obscure, and likely to remain so.

The same year as Rennell's Memoir, TIEFFENTHALER'S work was published by BERNOULLI. There we are told about the boundaries of Kashmir: Oestlich dieser Provinz, liegt Parestan und der Fluss Tschinab; südöstlich, Manhal und die Gebirge von Zambu; nordöstlich, Gross-Tibet; westlich, Pacli und der Fluss Kischenganga.³

The information regarding Kashmir and Kashgar, as given in the same work, is obviously taken from BERNIER:

Der Provinz Caschmir liegt nordöstlich von Caschgár. Der kürzeste Weg dahin geht durch Gros-Tibet; weil man aber nicht durchgelassen wird: so geht man durch Klein-Tibet in folgender Richtung:

Zuerst bis Gurtsh, eine kleine Stadt und Grenzort des Caschmirischen Gebiets, vier Tagereisen weit; von da acht Tagereisen bis Ascard, die Hauptstadt von Klein-Tibet; von da bis zur Stadt Schäkär. Dann geht es 15 Tagereisen durch dicke Wälder bis an die Grenzen von Klein-Tibet; nach andern 15 Tagereisen bis Caschgár, die ehemalige Residenz des dortigen kleinen Königs; igt ist es Yarcánd, zehn Tagereisen nördlicher.

Von Caschgár bis Chatay, oder die an Sina grenzende Tartarey, auch das nördliche Sina genannt, ist eine Reise von zwey Monaten, welche die Kaufleute in Gesellschaft machen. Sie holen daher das wider die Lustseuche dienende sinesische Holz, das augen-

¹ *Memoir of a Map of Hindoostan*. Second Edition. London 1785, p. 50 et seq.

² *Op. cit.*, p. 103.

³ Johann Bernoulli: *Des Pater Joseph Tieffenthaler's historisch-geographische Beschreibung von Hindustan etc.* Erster Band. Berlin 1785, p. 50.

stärkende Mamiron und die vortreflich abführende Rhabarber, und bringen diese Waaren nach Persien. Einige gehen von Chatay über Lassa nach Indien zurück

It was no easy task for the geographers even at so late a date as the end of the 18th century, to bring order into the scanty information which had been given on Tibet by different travellers. M. CH. SPRENGEL is right in saying:¹

Wir besitzen mehr als eine Beschreibung von Tibet, dennoch lassen sich weder die Namen noch Eintheilungen der Provinzen nach den verschiedenen Beschreibern untereinander vereinigen, und die neuesten Berichte von diesen Gegenden, nennen grosse Reiche, von denen sich in ältern Nachrichten weder Spur noch Meldung findet.

At another place SPRENGEL gives the history of all journeys known to have taken place in Tibet and concludes with: Das grosse Reich des Dalai Lama . . . ist uns Europäern grösstenteils unbekannt.²

Even amongst travellers in the east the knowledge of the mountains north of India was, as a rule, very meager. What could be expected regarding the mountain ranges in the interior when even Himalaya was so little known as seems to have been the case with Major MICHAEL SYMES? Speaking of a war Ava carried on against some of her neighbours, in the year of 1774, he says:

In his progress he (the general Oundaboo) overcame Anoupsing, prince of a country called Muggaloo; thence he is said to have penetrated within the Hamalaya hills, which form a continuation of the lofty Imaus, and seem to be a barrier raised by nature, to protect the mild unwarlike inhabitants of India, from the more hardy natives of the East, who, unrestrained by such impediments, would ages since have spread desolation along the fertile banks of the Burhampooter and the Ganges.³

Muggaloo is of course Mogul. The curious thing is that he, in 1795, cannot get rid of the old Imaus, and that he is ignorant of the fact that Himalaya and Imaus are one and the same mountain.

S. F. GÜNTHER WAHL, in his Asiatic handbook, has tried to bring into systematic order the knowledge of his time regarding the regions north of India. He makes use of the classical names for the mountains, and tries to show that Little and Great Tibet belong to India:⁴

Turkh Hind, oder die Tatarei von Indien, wie die orientalischen Geographen zu reden pflegen, begreift den am Fuss des alten Paropamisus Gebirgs, und des Imaus oder Emodus belegnen Strich Landes, zu welchem die bergiget Landschaft Gkakares oder Kokonor, das Reich Khaschemyr, und Klein- und Gros-Tibet gehören, dass dieser grosse Strich Landes mit in dem geographischen Umfang von Indien begriffen sei, erhellet schon vorläufig aus der orientalischen Benennung. Hernach erhellet es noch ausdrücklicher aus dem inländischen

¹ *Geschichte der wichtigsten geographischen Entdeckungen bis zur Ankunft der Portugiesen in Japan 1542.* Halle 1792, p. 28.

² *Reisen nach Butan und Tibet vom Kapitain Samuel Turner.* Aus dem Englischen von M. C. Sprengel. Weimar 1801 . . . in *Bibliothek der neuesten und wichtigsten Reisebeschreibungen* . . . Band IV, Introduction.

³ *An Account of an Embassy to the Kingdom of Ava sent by the Governor-General of India in the year 1795.* London 1800, p. 78.

⁴ *Altes und Neues Vorder- und Mittel-Asien etc.* . . . Erster Band. Leipzig 1795, p. 361.

Sprachgebrauch der Inder selbst, und aus gewissen geographischen Angaben der Araber so wohl als der übrigen Orientalen, und selbst der Griechen. Die letztern lassen die indischen Provinzen auf nördlicher und östlicher Seite an Skythien und Ssina (die Tartarei und das sinesische Reich) gränzen und ziehen die nördliche Gränzlinie genau an dem Emodus hin, so dass also ganz Tibet in den Umfang von Indien eingeschlossen bleibt. Eben so gränzt Indien nach der Geographie des Moseh von Chorene gegen Norden an Chor'assân und Skythien; Tibet ist also auch bei diesem Schriftsteller ein Theil von Indien.

He enumerates the different states and kingdoms of India and amongst them: endlich der Staat der Koschoten in Kokonor und Tibet. Die Koschoten sind ein Zweig des mogholischen Stammes Boudenser.

In the following passage he approaches our regions:

Gkakares, auch Kakares geschrieben, oder Kokonor (bei einigen Kukaneer), macht einen Theil von Turkh-Hind aus Das eigentliche Kokonor, das Stammland dieses Namens, das von dem See Kokonor oder Hoho Nor (blauen See) benannt ist, und auch Sintschai (Zinchai) heisst, liegt nördlich über Sina: unser Kokonor oder Gkakares aber, eine Provinz am Indusflusse, ist an der Seite von Kleintibet, Khaschmyr und Pendshjab gelegen, und wird gemeiniglich so weit östlich ausgedehnet, dass ihm Nagkrakhut, Syba und Pitan gegen Süden zu liegen kommen.

Of Little Tibet he says:

Kleintibet, welches man im Indischen auch Bollodhekhan genannt findet, ist der nordwestlichste Theil von Tibet, und gehört also wie Tibet überhaupt in den Inbegriff der sogenannten Tatarei von Indien oder Turkh-Hind.

He says that Tibet, according to the oriental authors, belongs to the kingdom of Belhara; to the east it borders upon China, to the south upon Ascham and Ava and to the dominions of the old Mogol Empire, to the west upon Khaschmyr and Gkakares, to the north upon Great Tartary. The name Belhara included the whole of Tibet and the ancient Indian kingdom of Porus, to which at least the western part of Tibet must have belonged.

Denn damit stimmt es auch überein, dass die Kette der Nebelberge oder der Berge Belour, die sich um die Quellen des Oxus anhebet, und sich durch den Staat von Tibet hinziehet jenen Schriftstellern zur Bezeichnung der Lage des Reiches Belhara dienet, und dass sie dieses Reich einstimmig gegen Süden von Chänbaalik stellen.

The classical mountain systems he explains thus:

Paropamisus, oder die Länder der Paropamisaden begreifen die Gränzländer des alten persischen Reichs an der Seite von Indien, welche unter dem so genannten Paropamisosgebirge liegen. Die Gebirgskette Paropamisus ist ein Theil des grossen Taurusgebirgs, welches ganz Asien in seiner Mitte durchschneidet. Sie ist der Kaukasus von Indien, die Kette der sogenannten Hindou- oder Schneegebirge.¹

In these passages we find a serious attempt to explain the great features of the complicated geography of Central and Southern Asia. Considering the meager material existing at the time, the result at which Wahl has arrived is rather good.

¹ Op. cit., p. 400 *et seq.*, 570.

His Boudenser must be natives of Buthan, his Bollodhekhhan Baltistan, and his Belhara Belur. The notion of a mountain range crossing the whole of Asia is very old, but his identification of the Indian Caucasus with the Hindu-kush or Snowy Mountain is his own. Here he seems to believe that the Hindu-kush and Himalaya are one and the same system.

Fra PAOLINO at the same epoch, not only mentions the name Himalaya in a somewhat corrupted form, but identifies it with the Imaus. He has a long discussion on the mountains north of India, and finally says:¹

Adunque dalle montagne di Kordistan, che sono un seguito delle montagne Indiche, da'Brahmani chiamate Himala o Hemàdi, e dai Greci e Latini nominate Imau od Emodii montes, incominciò a propagarsi nel primo e secondo secolo dopo il Diluvio il genere umano *Mala* monti, *Himma* freddo, indi Himmala monti freddi, che separano l'India dalla Battriana e dal Kordistan, paese, come dissi col P. Maurizio Garzoni, di molte ed altissime montagne, che costituiscono una sola catena coi monti Imau o Himmala.

The Himalaya became settled, a few years later, as being the same as the Imaus of ancient authors. As an example I will only quote the following words of D. J. F. HENNICKE in his *Beschreibung von Népàl* which is simply a compilation: Die von Nordwest gegen Südost auf den Gränzen von Tibet und Butan hinabziehenden Schneegebirge machen einen Theil des Imaus oder der Himmaleh oder Himaloga-Gebirge aus.²

Another very well done compilation of the same author has the title: *Beschreibung von Kaschemir*,³ in which he quotes the Ain-i-Akbari, BERNIER, FORSTER,⁴ RENNELL and others. He finds Kashmir to be bounded in the N. E. by »the Tibetan mountains» and relies upon Forster as authority. To the N. E. is Great Tibet, and to the N. W. Little Tibet.

The very clever and intelligent Captain F. WILFORD in his article *An Essay on the Sacred Isles in the West*, also enters the question of the great mountain ranges, and his sources are the Sanskrit literature, the Chinese, PURANGIR, DEGUIGNES and others.⁵ He also mentions the Nien-chen-tang-la, which may be regarded as the eastern continuation of the southern Kara-korum System. His words run as follows:

The summit of Méru is represented as a circular plain, of a vast extent, surrounded by an edge of hills. The whole is called Ilávratta, or the circle of Ilá, and considered as a celestial Earth, or Swargabhúmi; and it is thus called to this day, by the people of Tibet, the Chinese, and the Tartars; and like the Hindus, they have it in the greatest veneration, worshipping its encircling mountains whenever they descry them. According to

¹ *Viaggio alle Indie orientali umiliato alla Santità de N. S. Papa Pio Sesto Pontefice Massimo da Fra Paolino da S. Bartolomeo Carmelitano Scalzo*. Roma. CID.IDCC.XCVI, p. 321 et seq.

² v. Zach, *Monatliche Correspondenz zur Beförderung der Erd- und Himmels-Kunde*. Vierter Band, Gotha 1801, p. 590.

³ Loc. cit., p. 481.

⁴ *Vide* Vol. II, p. 9, where the map of Kashmir by Capt. Gentil is reproduced as Pl. II.

⁵ *Asiatic Researches*. Vol. VIII. London 1808, p. 314.

De Guignes, the Chinese call them Tien-c'han and the Tartars Kiloman, or the celestial mountains. In Tibet they call them Tangra, or Tangla, according to F. Cassiano and Pura'n-gir; the latter accompanied the late Lama to China, and gave me an accurate journal of his march from Tissoo-Lumbo to Siling, or Sining. Tingri, in the language of the Tartars and Moguls, signifies the heavens; and even Tibet is called Tibet-Tingri, or the heavenly country of Tibet. The name of Tien-c'han is given by the Chinese to the mountains to the North of Hima: to the Southern part of the circle, they give the name of Sioue-c'han, or snowy mountains. This range, says De Guignes, runs along the northern limits of India, toward China, encompassing a large space, enclosed, as it were, within a circle of mountains. The Southern extremity of this circle is close, according to the present Hindu maps, to the last, or Northern range, called Nishad'ha; and this is actually the case with the mountains of Tangrah, near Lassa, which is in the interval between the second and third range. According to F. Cassiano, the mountains of Tangrah are seen from the summit of Cambála, several days journey to the Westward of Lassa. The famous Pura'n-gir left them on the left, on his way from Tissoo-Lumbo to China, at the distance of about twelve coss, and did not fail to worship them. At the distance of seventy-seven coss from the last place, he reckoned Lassa to be about twenty coss to the right; twenty-three coss beyond that, he was near the mountains of Ninjink Tangrá, a portion of that immense circular ridge. In his progress toward the famous temple of Ujuk, or Uruk, called Souk in the maps, he saw them several times. Close to Ninjink-Tangra he entered the mountains of Lurkinh, called Larkin in the maps.

From German sources, more specially from PALLAS, is an article by J. REUILLY, 1808. Here the climate of N. E. Tibet is described thus:

Le Tangout est un pays étendu et peuplé; comparativement à la Sibérie, il est situé sous un climat très modéré. Les rivières ne gèlent que dans la partie du nord où la neige a de la durée.¹

¹ *Description du Tibet, d'après la relation des lamas Tangoutes, établis parmi les Mongols; traduit de l'allemand avec des notes, par J. Reuilly. Paris, 1808, p. 5.*

CHAPTER XII.

YEFREMOFF, DANIBEG, AND OTHERS.

Supposing that there might exist in the libraries or archives in St. Petersburg some narratives of earlier Russian travellers in our regions of western and southern Tibet, I wrote, a few years ago, to General O. VON STUBENDORFF and asked him if he had heard of any such narratives. The General had the great kindness not only to make inquiries himself, but also to ask some of his geographical friends to do the same. In the following pages I relate the results as General Stubendorff has given them to me in his letters. From a geographical point of view the harvest is not rich, but the names and travels of these early Russians should not be forgotten. In a letter of January 1911, General Stubendorff tells me that he has found in the library of the Imp. Russian Geographical Society the narrative of JEFREMOFF'S travels.¹

The author is a good observer, but pays most of his attention to the customs and habitudes of the different peoples and tribes he comes across. The description of the route he has followed is very poor. In the portion dealing with the journey to Kashmir the names are so rare that one can only follow the principal features of the route.

After 8 years' captivity by the Kirgiz, Yefremoff succeeds in escaping, about 1781. He goes over Kokan to Margelan and Osh, and thence to Kashgar and Yarkand where he remains a whole month. Accompanying some merchants he continues to Tawat or Tibet (Leh). The road takes him amongst mountains and along precipices. The river streaming in these mountains is called Atak. There are no villages along the road. Fifteen days' marches before Tawat a mountain has to be crossed, where the air is very heavy, the fog never disappears and men and horses become so short of breath, that they nearly suffocate. Thirty five days' marches

¹ *Rossiiskago Unter-Offisera Jefremova, nijne Kolleshskago Assesora desjatiletnoje stranstvovanie i prikljutshenie v Bukhari, Khive, Persi i Indi i vosvrashtszenie attuda cheres Angliju v Rossiju; pisanoe im samim, v Sanktpeterburge, 1786 god.* (Ten years wanderings and adventures of the Russian Subaltern Yefremoff — now Assessor of College — in Bukhara, Khiva, Persia and India and his returning from there via England to Russia; written by himself in St. Petersburg, 1786 A. D.) I have not changed von Stubendorff's transcription of the Russian.

were necessary for taking us from Yarkand to the little place Tawat or Tibet in the kingdom of Lata or Latak.»

Yefremoff dwelled some 25 days in Leh from where he went on to Kashmir. General Stubendorff tells me that with the name Tawat or Tibet, Yefremoff also understands the whole country in which he now travelled, though he also calls it more specially »Tsang«. General Stubendorff also believes, and rightly so, that the high mountain Yefremoff mentions is the Kara-korum Pass.

In a long series of chapters Yefremoff describes Tawat, dealing especially with the inhabitants and only briefly with the geography. The titles of the chapters are: (1). Description of Tawat or Tibet (where only the names of some provinces and neighbouring borderlands are mentioned). (2). The mountains (very short and only giving the names of two mountains: Langur and the highest of all, Kambala); it is curious that he only knows the mountains mentioned by the Capuchine missionaries on their journeys to and from Lhasa! (3). Animals. (4). Minerals. (5). The people and their religion. (6). The baptism. (7). The wedding ceremonies. (8). The burial. (9). The faith. (10). The great holiness, corresponding to the holiness of Dalai Lama, living on one of the islands in the lake Polte or Yamdzo or Yamiso.

Of geographical interest is the following passage: »Tibet or Tawat is a Mongolian name. The Chinese call the country Tufan or Sitsang; the inhabitants of the country use the expression Kiang, whereby the northern part, which borders to Hindustan, is called Butan, and the southern has the special name Tibet — the upper part of which is Doklo and the lower Pü. Some years ago Tibet was divided into three parts: an upper, a central and a lower. The upper Tibet is the country of Ngari, which by the gods has been called the country of the elephants; Central Tibet containing the provinces Tsang, U and Kieng, was by the gods called the country of the apes, and finally lower Tibet with the provinces of Takbo, Kongbo and Kang, has got the name of the 'country of Prasrinma'. In the east Tibet borders to China, in the south to Hindustan, Ava and other regions beyond the Ganges; in the west to Kashmir and Nepal, and in the north it is the great desert Shamo, which separates Tibet from Lille Bokhary.»¹

From Kashmir Yefremoff travelled to several places, as Delhi, Lucknow, Benares and Calcutta. Finally he crossed the Indian Ocean in two months and six days,

¹ Professor H. H. WILSON who published MIR IZZET ULLAH'S narrative having stated that this pioneer's route lies between Leh and Yarkand, adds: »It seems probable, indeed, that a Russian officer preceded our traveller; the circumstances under which this occurred are thus described in the 26th. Number of the *Journal Asiatique*: 'In 1774, a subaltern officer of the Neugorod regiment of infantry, named Yefremof, was carried off from his post by the Kirghizes, and conveyed into Bokhara. The Atalik appointed him inspector of his seraglio, and afterwards obliged him to render military service, in which he rose to the rank of Yuz bashi, or captain of cavalry. Yefremof accompanied the troops of the Atalik in different expeditions to Samarkand, Mawra, and Khiwa. From thence he escaped to Kokend, Kashgar, and Yarkand, and penetrating across Tibet, made his way to Calcutta, from which

reached St. Helena in 19 days, and Ireland in one month and 19 days. From London he travelled to St. Petersburg where he arrived in August 1782.

CHERNICHEFF is the name of a Russian who, about the same time as Yefremoff, or in 1780, travelled from Bokhara to Kashmir. He was told that in the mountains »to the right of the road from Cashghar to Yarc'hand the Indus had its source», by which the Shyok seems to be meant.¹

In another letter, from March 5, 1911, General von Stubendorff tells me that the Privy Counsellor KOBKO had found, in the public library in Petersburg, a translation from Grusinian into Russian about DANIBEG'S journey to India.²

General Stubendorff writes that Danibeg's description contains even less details than that of Yefremoff, and what he has to say about the inhabitants and their customs cannot at all be compared with the corresponding parts of Yefremoff's narrative. Only the route which Danibeg has followed is of the greatest interest. It was in 1795, when Grusia was still an independent state, that the king, Irakli, sent Danibeg to Madras on a personal mission to a rich Armenian.

The traveller passed the following places, — here written in his own spelling: Achalzech, Arsrum, Mush, Arghana, Falu (Palu), Mertin (Mardin), Tikranakert (Diarbekir), Mossul, Babilon (Bagdad), Basra, and from there by ship *via* Maskat, Bombay, Columb (Colombo), Manar to Bondocheri over Cost-Malvar, then over land to Trakber (Tranguebar) and Madras. Here he found that the rich Armenian had died, but he could arrange matters with his son.

To become better acquainted with the country, Danibeg took a very long roundabout way in returning. With the intention of going to Bek or Ranchur (Rangoon) he went on board a ship which, however, was driven to Mushli-Bandar (Masulipatam?) by a storm and only from here he could start again for Rangoon. From this place he steered to Colcada (Calcutta), but after an 18 days' journey the ship was wrecked, and Danibeg was one of the four lucky ones who by the help

place he returned to Europe in an English frigate. In 1782, he arrived at Petersburg, where he published a narrative of his adventures, with some descriptions of the country he had visited in his travels.» *Journal of the Royal Asiatic Society*, No. XIV, London 1843, p. 294.

Of the same traveller BRETSCHNEIDER has the following short information: »The first European who, after the Castilian ambassador (Clavijo), saw Samarkand, was the Russian subaltern Yefremof. He was made prisoner in 1774 by the Kirghizes at the frontier south of Orenburg, and sold to a Beg in Bokhara but he at length succeeded in escaping, and fled westward to Samarkand, Khokand, Marghilan, where he passed for a Nogai Tartar. Here he joined a caravan which was going to Kashgar and from Yarkand took the route to India via Tibet and Delhi. Having reached Calcutta, he embarked for Europe reached London, and in August 1782 St. Petersburg, where he published the narrative of his peregrinations.» *Mediaeval Researches, etc.* Vol. II, London 1910, p. 268.

¹ *Asiatic Researches* V, 1808: »An Essay on the Sacred Isles in the West» By Captain F. Wilford, p. 325. The section from Khodyent to Osh Wilford has improved from native information, and in this connection he quotes Strahlenberg and his map of Asia.

² *Puteshestviye v Indiu Gruzinskago dvorjanina Rafaila Danibegova perevod s Gruzinskago*, Moskva 1815.

of the boat could save their lives. After 19 days the shipwrecked men finally reached shore at the mouth of the river Kikaja (Akyab?). By a fishing boat they were taken in two days to Bachar-Kann (Bakargang), and to Calcutta on an English ship.

On his way from Calcutta to Kashmir he mentions the following cities: Serampur, Tshitshru (Chandarnagar), Marshitabad or Machsutabad, Munkir (Monghyr), Asimabad or Fatona (Patna?), Banaris (Benares), Laknahor (Lucknow), Kamber (Cownpur), Farachabad, Mered (Meerut), Delhi, Fadifur (Fatehpur), Lahor and Norpor or Far (Kistavar?). From Kashmir he reached the town Tibet (Leh) in 20 days, and thence Yarkand in 40 days. His way took him over a desolate, uninhabited country, through terrible precipices and over the highest snow mountains, but here there are no geographical details whatever, and his narrative is as poor as Yefremoff's. According to Professor W. W. GRIGORIEFF Danibeg's own description of this part of his journey runs as follows:

»This journey was very annoying to me as the barrenness of the country I was travelling through.... and the very high mountains amongst which some were covered with ice, rose in my heart an unsupportable feeling of sorrow, and this feeling became the more heavy as the whole country was uninhabited. And therefore, my only wish was to travel through these regions as quick as possible. At last one could see the town Yarkant. The luxuriant parks that surround it present to the traveller a very agreeable and consoling view.»¹

From Yarkand Danibeg was 13 days on his way to Aksu, from where he directed his steps to Turfan and in three months to Semipalatinsk. *Viâ* Omsk he finally came to Moscow. Danibeg does not say how long he stayed in every town, but his remarkable journey took him a considerable part of his life or 18 years. When he returned Grusia had been conquered by Russia, and it was to Tsar Alexander I that he dedicated his work.²

I am indebted to General Stubendorff for a third letter, dated March 27, 1911, in which he tells me that Mr. Kobeko has found a narrative of another traveller, who, however, is not Russian and has only visited eastern Tibet. But his journey is of interest as he, in 1792, visited Lhasa. He was of Greek extraction and belonged to a family living in Venice, became a priest and carried during ten years the title

¹ *Землепользіе К. Риттера. Географія странъ Азіи. Восточный или Кутайскій Туркестанъ. Выпускъ второй. Дополненія. С.-Петербургъ 1873, ст. 413.*

² Prof. H. H. WILSON makes a short reference to Danibeg, quoting MEYENDORFF: *La Relation d'un Voyage aux Indes*, by Raphael Danibeg, «a Georgian gentleman, printed at St. Petersburg in 1815. He travelled from Kashmir to Semipalatinsk by way of Kashgar.» (*Travels in the Himalayan Provinces of Hindustan etc.* . . . by William Moorcroft, published by H. H. Wilson, London 1841.) The works from which more detailed information may be got regarding the journeys of Yefremoff and Danibeg are enumerated in Vol. I, Part 1 of Prof. N. KÜHNER's Work: *Описаніе Тибета, Примѣчанія*, ст. 78. Humboldt quotes the following passage of his narrative: Ich ging von Kaschmir nach Tibet, einer auf Hügeln erbauten Stadt, deren Einwohner viel Wolle aus Lassa beziehen und nach Kaschmir ausführen. Humboldt observes that Danibeg's City of Tibet is Leh. — *Central Asien*, II, p. 231.

of »MITROPOLITAN CHRYSANTHIOS» of New-Patra near Athens. In the year 1784 he left his place and went to Constantinople and Syria. In Aleppo he joined a company of English merchants, who travelled to India. His road takes him to the Euphrates, over the Persian Gulf to Maskat; in Surat he reached the Indian coast. From Bengal he made a trip to Lhasa in the company of some Greek salt merchants, who were allowed to enter Tibet. The journey went along the Brahmaputra, *via* Tarengas, Ong and Nichtay(?). After having left the Brahmaputra, which in its upper course was called Sampu, our traveller reached a town called Tunsior. Here he was stopped, as Christians, and especially a Christian Metropolitan, were not allowed to visit Lhasa itself. But against every expectation Dalai Lama issued an order that the foreigner should be brought before him, and thus the Metropolitan Chrysanthios reaches Lhasa, where he for 17 days enjoyed the hospitality of the 11 year old Dalai Lama, and received rich presents in money and clothes from him.¹

Our traveller exaggerates bravely in his description of Tibet. So for instance he estimates the population of Lhasa to 1½ million and calculates the army of the country, cavalry and infantry to be 300.000 men with 2000 elephants. In spite of the friendly reception he was not allowed to fulfil his wish and continue to China, and all he can do is to return to India. One of the ministers accompanied him the whole way to Patna. There he decided to go to Russia (1792—1795) and passed the following places on his way: Benares, Agra, Delhi, Kashmir, Kandahar, Ghasni, Kabul, Balkh, Bokhara, Khiva, where he was retained for a year. Thence he passed Mangyshlak, crossed the Caspian and reached Astrakhan. Ordered to St. Petersburg, in 1796, he delivered to Count Suboff, the chief of the troops which were sent against Persia, a manuscript in which he gave a detailed description of those Asiatic countries he had visited. Only in 1861 this manuscript was published, together with a short narrative of the journey, by W. W. GRIGORIEFF.²

In 1805 the Metropolitan delivered to Count Rumiantseff, the minister of commerce, a second manuscript, containing an answer to the question »Whether one could travel easily and unmolested from Russia to Tibet». It is in this second manuscript that he mentions his journey to Tibet. In the first one he had omitted it as he believed it could not be of any interest to Russia, being so far and out of the way.³

¹ This is impossible as the eighth Dalai Lama, bLo-bzang 'Jam-dpal rgya-mts'o was born 1758 or 1759 and died in 1805, and therefore was 33 or 34 years old at the time of the Metropolitan's visit. The Tashi Lama, on the other hand, whose name was bsTan-pai nyi-ma, was born in 1781 and was 11 years old in 1792, at the visit of the Metropolitan. Samuel Turner, Warren Hasting's Ambassador, saw him in 1783, in the monastery gTer-pa-gling. It, therefore, seems doubtful whether the Metropolitan ever reached Lhasa. Cf. G. Schulemann: *Die Geschichte der Dalailamas*. Heidelberg 1911, p. 205.

² *Sapiska: Khristianf Mitropolita Novopatrasskago, o stranakh Srednei Asii, posleshtshonnikh im v 1790 godakh. Isdal s svedeniem i objasnenijami W. W. Grigorieff*. Moskva 1861.

³ It was published in 1884 by D. KOBKO.

CHAPTER XIII.

SOME MAPS OF TIBET FROM THE END OF THE EIGHTEENTH AND BEGINNING OF THE NINE- TEENTH CENTURY.

Before proceeding any farther in our historical account, we have to consider a few maps embracing a period of 30 years, or from 1790 to 1819. Of a few of these maps which seemed to be of greater interest than the rest, I have reproductions made. I need not say that during the period in question many other maps of our regions were drawn and published, but as my object is not to give a complete catalogue of maps, I have only picked out a few which would give quite a sufficient idea of the cartographical picture of Tibet at this epoch.

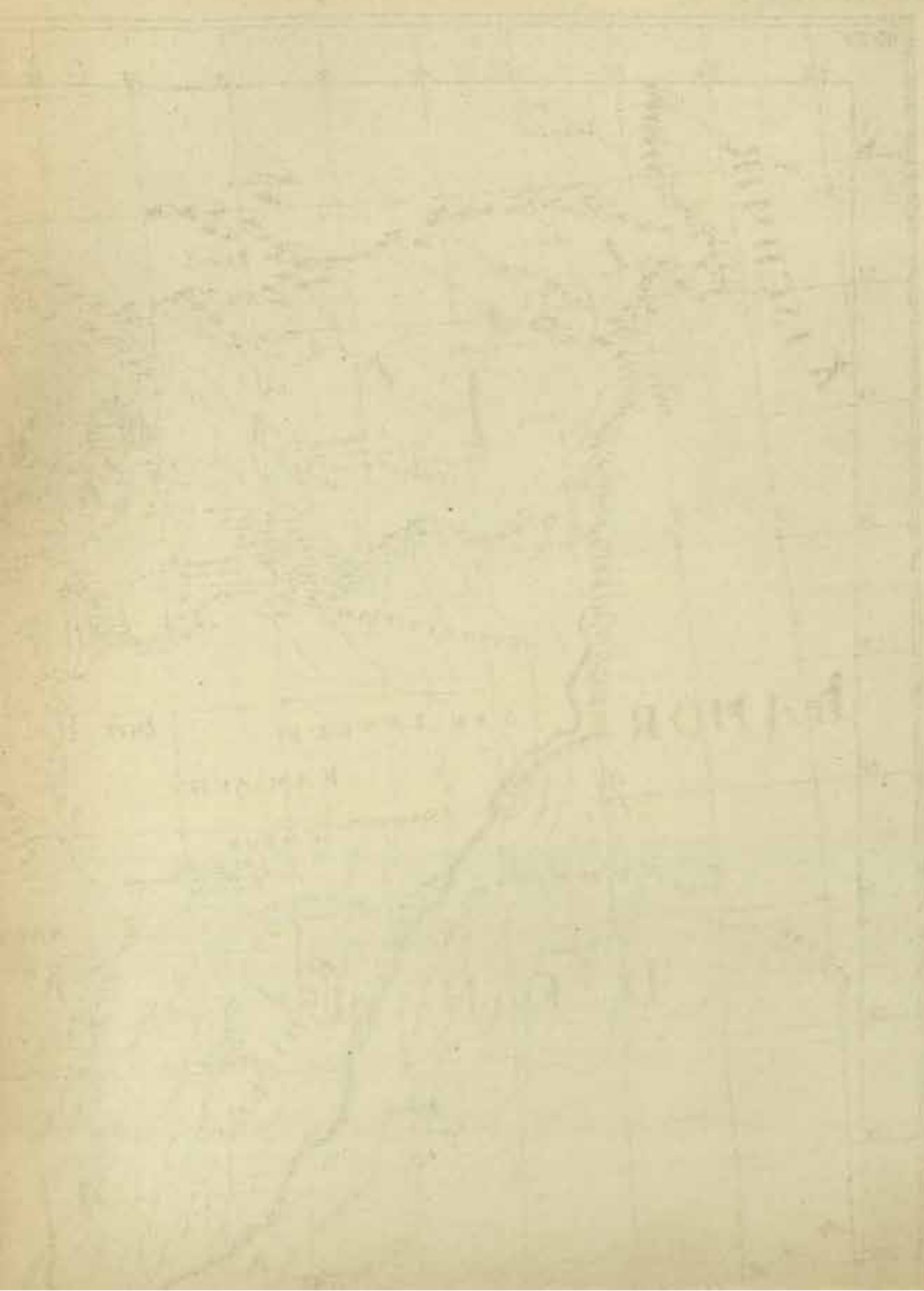
I begin with a German map, the original of which is to be found at the State Library of Berlin. Its title is: *Carte von Tibet nach den neuesten Nachrichten entworfen 1790* (Pl. XIII). It is a very rough and clumsy sketch from a technical point of view, but it is interesting as a representation of geographical detail. The sources are not mentioned but, as far as Tibet is concerned, we easily find traces of D'ANVILLE, TIEFFENTHALER and RENNELL. On the Upper Indus we find Tschasircong, Latak and Pitoc exactly as on d'Anville's map, and the river joins the branch from the lakes forming the Ganges, though the name »Ganga ou Fleuve», is not entered on the river which in reality is the Satlej. On the latter, Latang, Tsaprong and Tschumurti are entered. North of the Latak River, which in reality is the Upper Indus, there is a latitudinal range of hills, from which a ramification is directed N. E. with Rutuh on its southern and See Tsarin on its northern side; exactly like d'Anville. The eastern continuation of the principal range is called Kiangli oder Kangli Berge, corresponding to d'Anville's Kianeri M., all three of course standing for Kangri or Ice Mountain, usually written Gangri. The sources of the Tsangpo or Brahmaputra are taken from d'Anville; even the Na-uk Fl. is present.

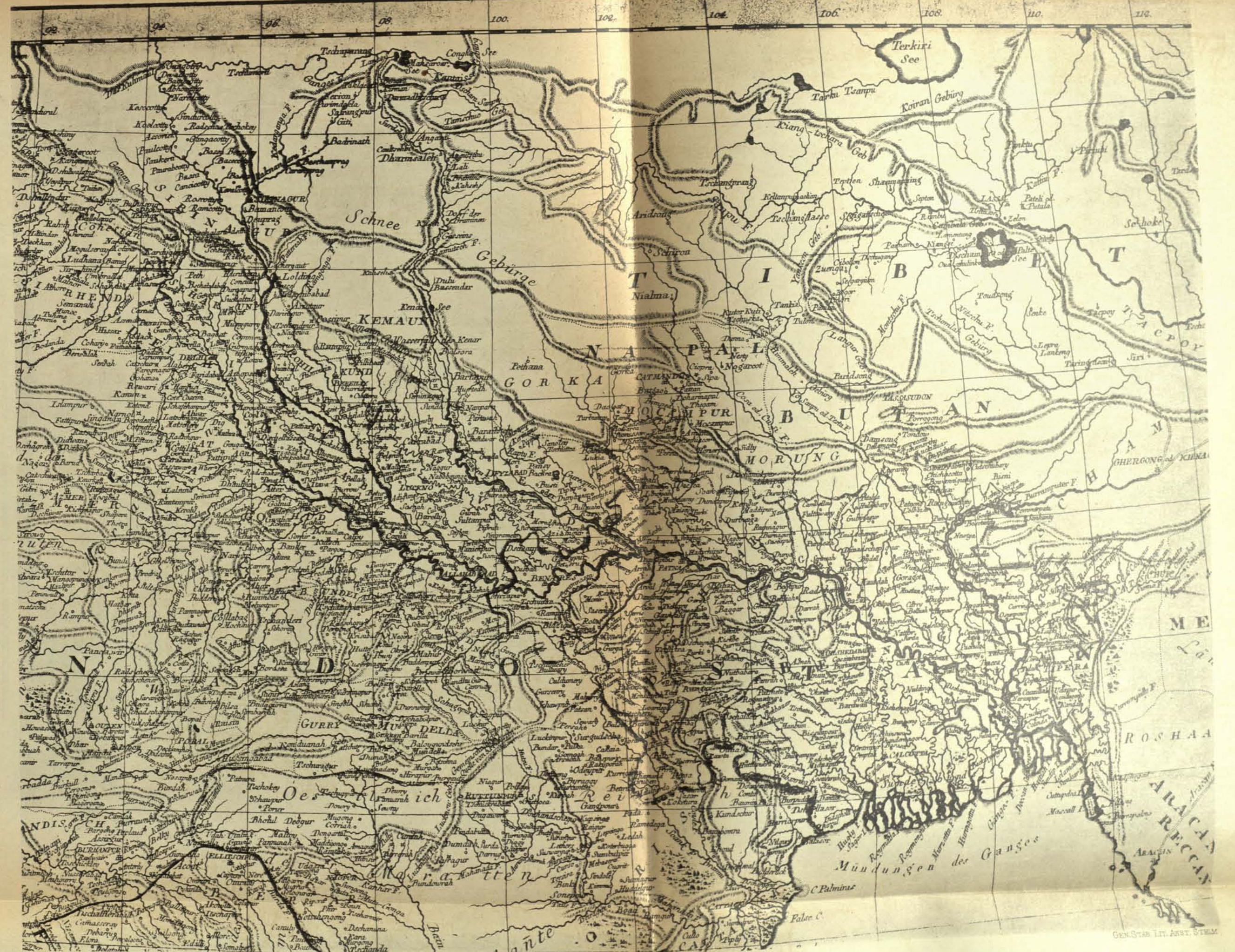
In this general situation created by the LAMAS of KANG HI and digested by D'ANVILLE, the map of 1790 has adopted the hydrographical views of Tieffenthaler,



Carte von Tibet nach den neuesten Nachrichten entworfen 1790.

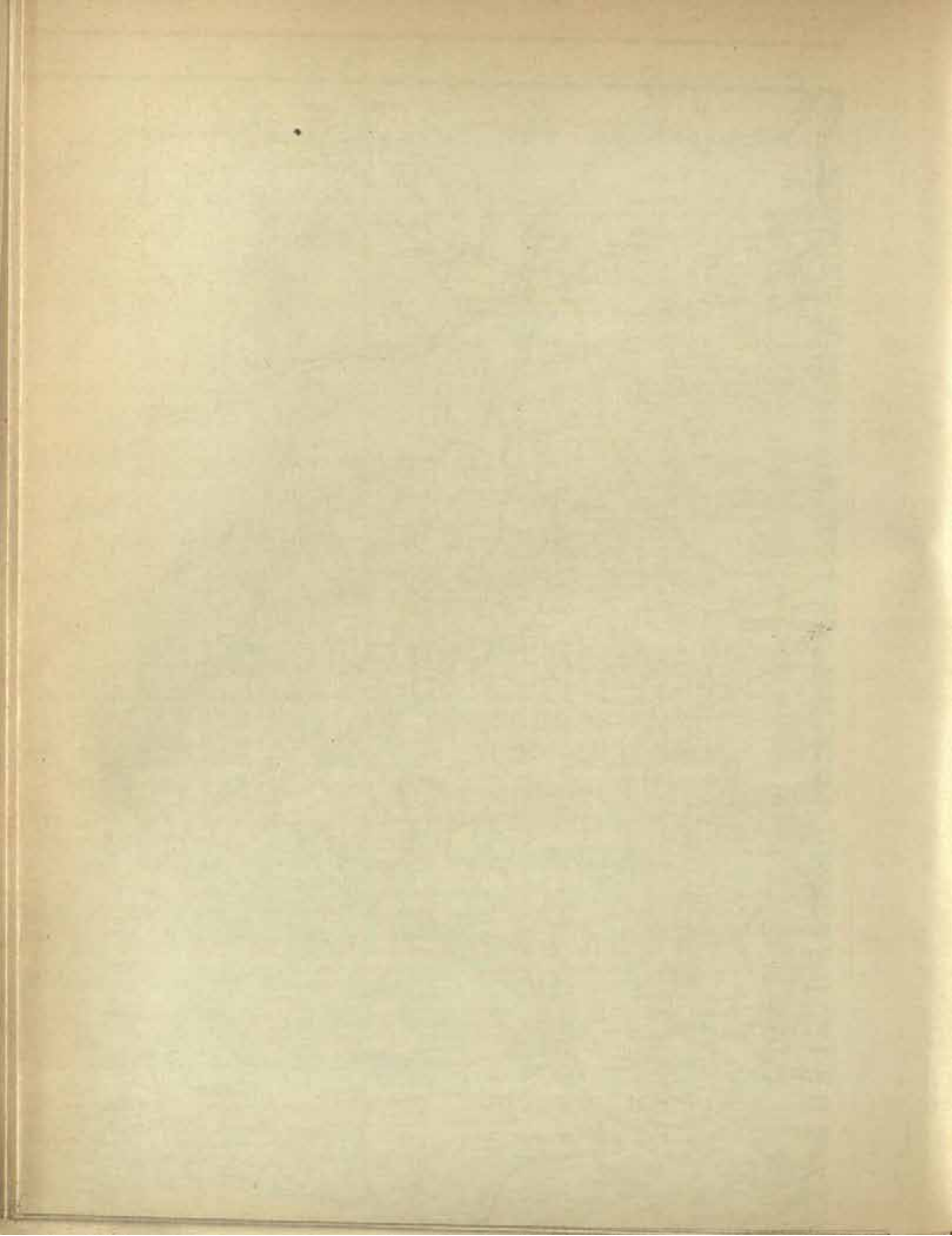
GEN. STAR. LIT. ABST. STRIM

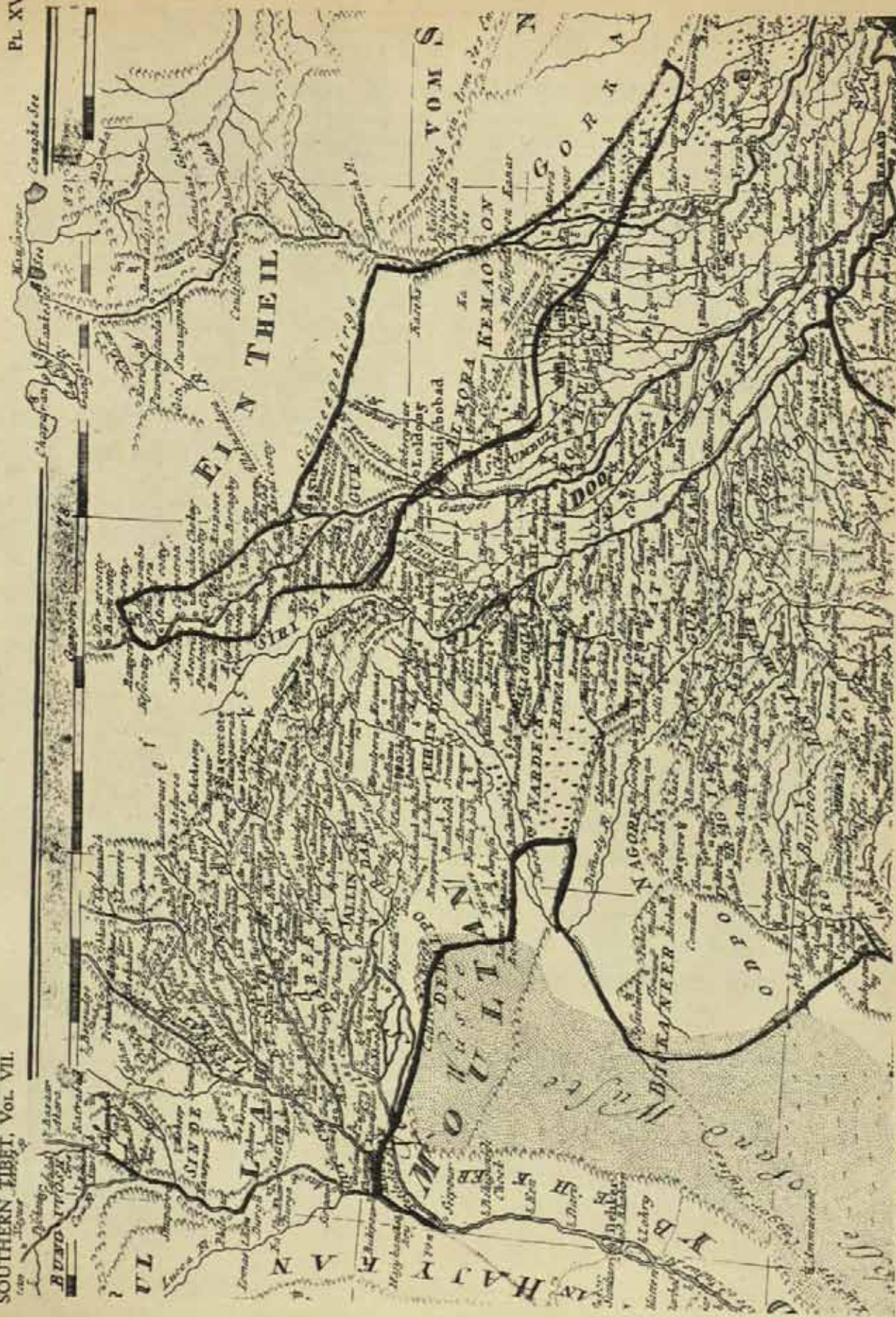




Charte von Hindostan und der Halbinsel nach Rennells, Campbells, Pringles,
Dierms Zeichnungen entworfen von C. Mannert Nürnberg 1797; 1:5500 000.

GEN. STAB. LIT. ANST. STETTIN





Vorder-Indien oder Hindostan oder auch Ostindien disseits des Ganges
nach J. Rennell, von Friedr. Gottl. Canzler, Nürnberg 1798. Bey d.
Homann. Erben ausgefertigt 1804.

so far as the two famous lakes are concerned.¹ But TIEFFENTHALER makes the Satlej take its origin from Mansaroar (See Mansaroar oder Mapang on the map), whereas the map of 1790 combines Tieffenthaler and d'Anville, and lets the Satlej of the former be the same river as the Ganga of the latter. The river from the Lanka Dhe is in both cases the Gagra. The temple of Mahadeo, *i. e.* Tugu-gompa is adopted. On the other hand the draftsman has not been able to accept the bifurcation of Tieffenthaler, who lets the Brahmaputra take its origin from Manasarovar. In this case he finds it more safe to follow d'Anville. The regions farther east are all taken from the French cartographer.²

Pl. XIV is the reproduction of a map which was published in Nürnberg in 1797 and is almost exclusively constructed from British originals. Its title runs: *Charte von Hindostan und der Halbinsel nach Rennells, Campbells, Pringles, Diroms Zeichnungen entworfen von C. Mannert*.³ It is coloured, 68 × 51 cm. in size, and on a scale of 1:5 500 000. On this map we also find traces of D'ANVILLE, TIEFFENTHALER and RENNELL, so far as Tibet is concerned. It embraces only Southern Tibet, and the Kara-korum region therefore does not come in. The Terkiri See, Tengri-nor, Tarku Tsanpu and the origin of the Ganges, are directly taken from d'Anville with the corrections of Father Tieffenthaler. The Ganges, therefore, comes from the Mansaroar See, which, however, receives an affluent from the Conghe See, an arrangement that is not quite in accordance with the Lama map.⁴ The Gagra River derives its origin from the Lanka See as on Tieffenthaler's map. The Kantaisse Gebürg has curiously enough been removed to the southern and eastern side of Conghe See, and from it a mountain range is drawn eastwards north of the Tsangpo. This range is called Kiang-tschara Geb., corresponds to the Transhimalaya, and seems to be constructed by combining all the detached ranges on d'Anville's map. South of the Terkiri See it sends a ramification, the Koiran Gebürg, to the E. N. E., which also is derived from d'Anville. The Himalaya is in the west called Schnee Gebürge, and farther east Himmaleh Gebürg. North of the latter is the Langur Geb. of the Capuchin Fathers.

The map reproduced here as Pl. XV is properly only a copy of the last-mentioned. It was drawn at Nürnberg in 1798 and published in 1804. The title is: *Vorder-Indien oder Hindostan oder auch Ostindien diesseits des Ganges nach*

¹ Cp. his map Vol. I, Pl. LII.

² The map does not reach sufficiently far north for showing the connection between Tibet and the desert of Lop. So much is clear, however, that Tibet was supposed to be a very narrow country, for »Wüste Coby» reaches even to the southern parts of Tibet in the region N. W. of See Terkiri or Tengri-nor. On a French map from 1780, *Carte Nouvelle d'Asie, Dirigée par Mr. Philippe . . .*, the desert of Central Asia does not reach quite so far south, for between it and Tibet there is a mountain range, Ima M., following the parallel of 35° N.

³ I am indebted to Professor MEISNER of Berlin for this and many other maps mentioned in this connection.

⁴ Vol. I, Pl. LI.

J. Rennell von Friedr. Gottl. Canzler. Nürnberg 1798, bey d. Homann. Erben ausgefertigt, 1804. 1:6 000 000. Comparing it with RENNELL'S map (Pl. I in Vol. II) we find that the hydrography around the Manasarovar is exactly copied from the English map.

I have also reproduced here as Pl. XVI the eastern half of Rennell's map *The Countries situated between the Source of the Ganges and the Caspian Sea, 1788.*¹ The representation of the complicated hydrography around the Sacred Lake and the Sources of the Ganges and the Indus is, of course, in accordance with the information of the Lamas and Father Tieffenthaler.

On another German map drawn and published by REINECKE in 1801, and not reproduced here, the same general situation as on Pl. XV is sketched.² At the Conghe Lake he has entered the legend: *Quelle des Ganges*, — and just south of it: *Quelle des Baramputer oder Sampo Fl.* The same names are written along the upper course of the river. It was KLAPROTH who, at a later epoch, confused this correct conception of J. Rennell.

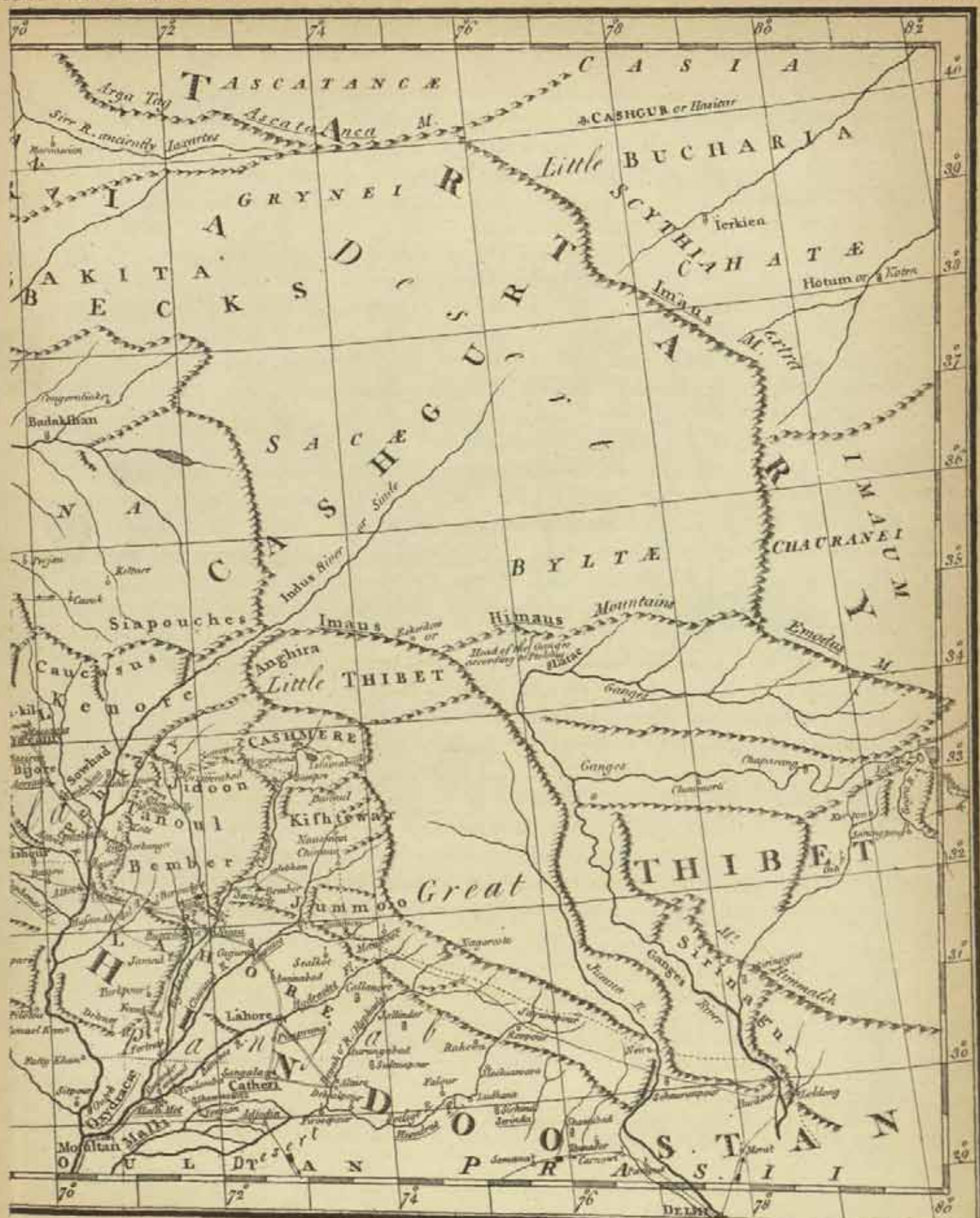
We now come to a most interesting and important map, *viz. Asia*, published in 1801 by A. ARROWSMITH, Pl. XVII.³ Separating Western from Eastern Turkestan, a very mighty mountain range is stretching from north to south. Its southern part is called Belur Tag. Its northern half forms a water-parting between the Sihon R. or Sir-daria and the Cashgar River. From the western side of the Belur Tag and from the Plain of Pamir the feeders of the Jihon R., or Amu-daria are streaming down. The drainage areas of the Sihon and Jihon Rivers are separated from one another by a latitudinal mountain range called Jespera Mts. The southern feeders of the Jihon R. are coming from the Hindoo Kho.

East of the Belur Tag is another range running N. W.—S. E. and finally turning S. W., being parallel to the Belur Tag, and to the course of the Indus. The feeders of the Khotan-daria, called Koten River, Orankash R., and Karakish, take their origin from the N. E. slopes of this range. A curious feature of the map which is, however, quite easy to understand, is the way in which Arrowsmith has placed the upper course of the Indus River. We remember that MONSERRATE 220 years earlier had given a quite correct general course of the Upper Indus. The latter was »captured» by the Lamas and transferred to the Ganges System, a view also kept by Arrowsmith. This famous cartographer has, in a quite new and original way, tried to make use of the information he has gathered from old sources. In the region in question we find the traces of GOËS, BERNIER, the LAMAS, TIEFFEN-

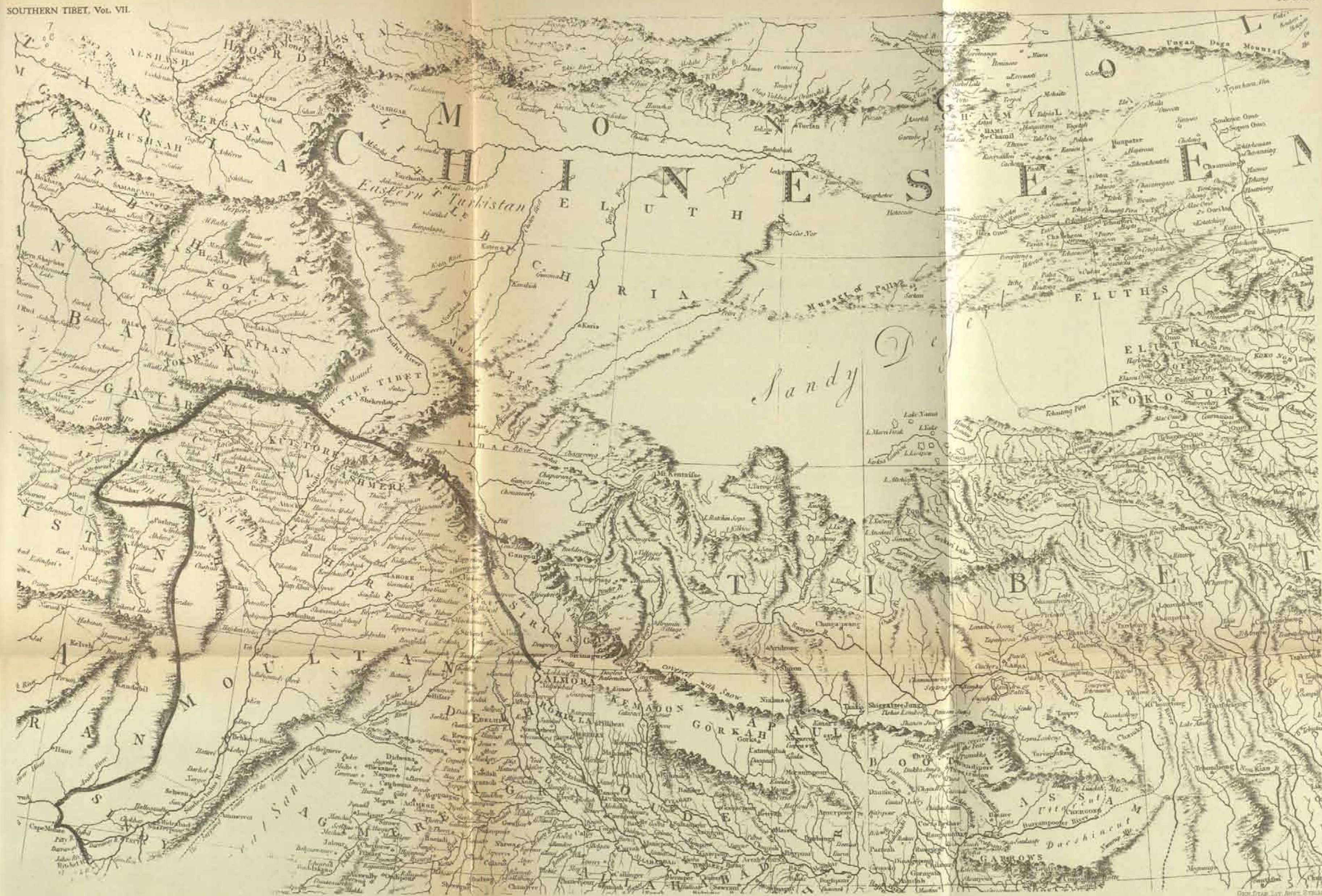
¹ *Memoir of a Map of Hindostan, etc.* by James Rennell, 1788.

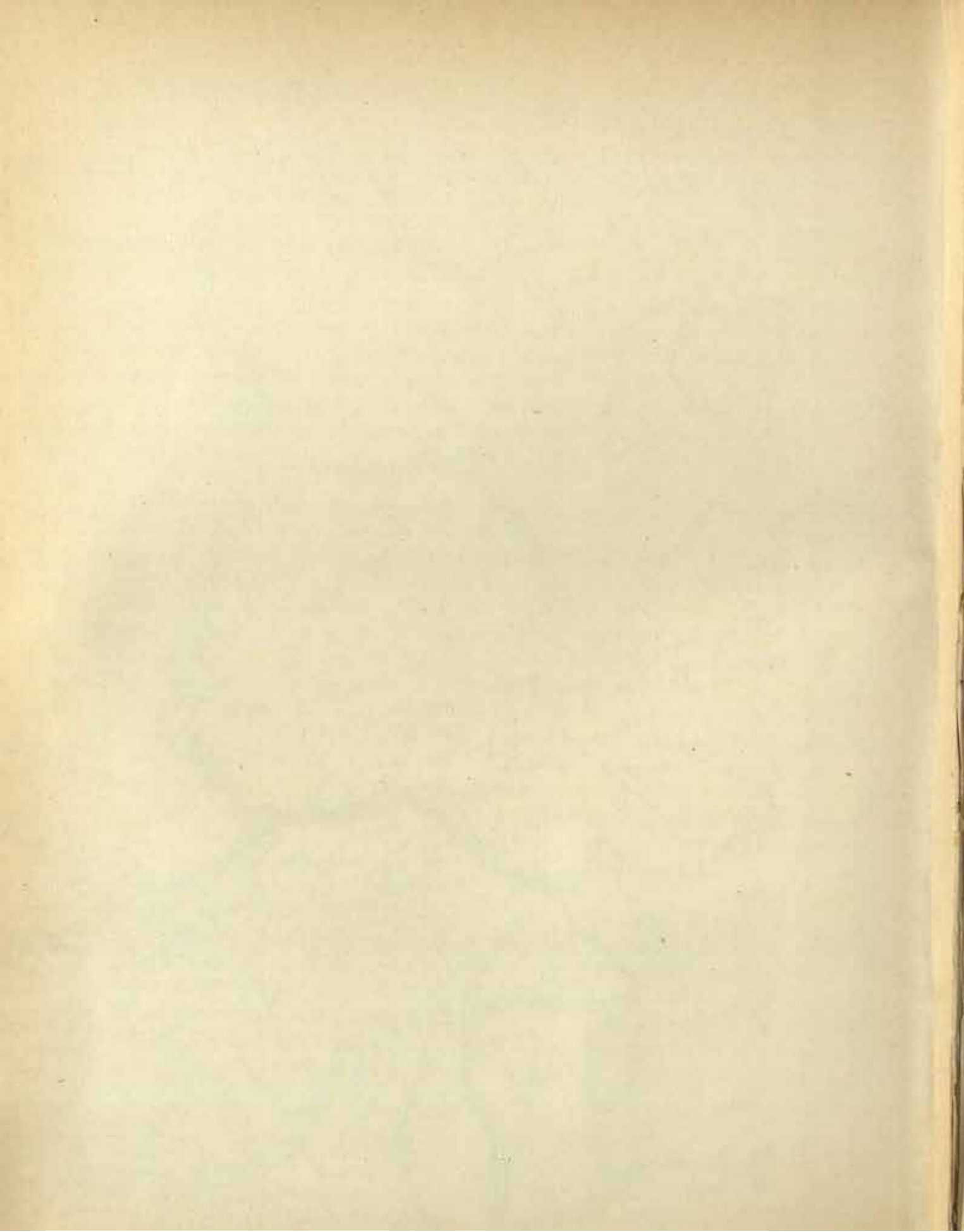
² The title of this map is: *Charte von Ostindien diesseits und jenseits des Ganges entworfen von J. C. M. Reinecke.* Weimar 1801. (Coloured, 84×46 cm.) Revidiert in Aug. 1804. Geogr. Inst. 1:10 000 000.

³ Its full title, including dedication runs: *Asia, To Major James Rennel, Esq. F. R. S. &c. &c. this map is inscribed, by His much Obligated Humble Servant A. Arrowsmith.* January 1st 1801.



The Countries situated between the Source of the Ganges and the Caspian Sea by J. Rennell, 1788.





THALER and CHERNICHEFF. The last-mentioned had said: »to the right of the road from Kashgar to Yarkand the Indus has its source». As Chernicheff, in 1780, had travelled through these regions, Arrowsmith had no reason for disbelieving his statements. And as the river from Mt. Kentaisse or Kailas, flowing W. N. W. to Ladac, was, according to the Lamas' survey, believed to belong to the Ganges System, the Upper Indus had to take its origin from somewhere else. To the west all ground was occupied by the Amu-daria, and thus Chernicheff's statement seemed from all points of view to be the most likely of all. The two parallel ranges which already appeared on STRAHLENBERG'S map, and which may be said to be the same as the Sarikol and the Kashgar Ranges, seemed also to agree with this arrangement, and to afford a drainage area well closed in between water-parting mountains, and projecting like an arrow between the drainage areas of Lake Aral and Lake Lop-nor.

South of Yarchand we still find two names from GOËS' journey: Jakonig and Sarikol.

Beginning from Cashemere, and proceeding northwards along the Upper Indus we meet all the names given by BERNIER. There is Gurche, his Gourtche, Shekerdou, his Eskerdou, Suker, his Cheker, and finally Forests, his Grande Foret.

North of and parallel with the Lachu River, in reality the Upper Indus, there is on the map of the LAMAS and D'ANVILLE, a long mountain range called in its different parts Tchala M., Toulia M., Noupri M., and Latatsi M. M. Farther east it is in connection with the Kentaisse or Kailas, and Patchon M. is its eastern-most part, the last name reminding one of Pachen, S. E. of the Kailas.¹ This long range is called Mus Tag on Arrowsmith's map, which is indeed a very remarkable feature, showing that the English draftsman in his interpretation of a part of the mountains belonging to the Kara-korum System, was a forerunner to KLAPROTH. One thing was not yet clear to the geographers of the time, *viz.* the great parallelism of the ranges and mountain systems between India and Turkestan. The Belur Tag and its neighbour range have grown quite out of proportion, and, therefore, too little space has been left to the Mus Tag south of the sources of the Khotan- and Keria Rivers.

Regarding the hydrography of the Manasarovar and the Rakas-tal ARROWSMITH, just as Major RENNELL and after him the German cartographers, has followed TIEFFENTHALER. Eastwards his representation of Tibet on both sides of the Tsangpo, is taken from D'ANVILLE. The northern half of the Tibetan highland he has left bare, as did also the Lamas and d'Anville. The latter has Cobi ou Desert de Sable, Arrowsmith, Sandy Desert. The lakes Cas Nor and Lop-nor are the same, though the latter is called Lok nor by the English cartographer. South of these lakes there

¹ Cp. Pl. 12 of my map.

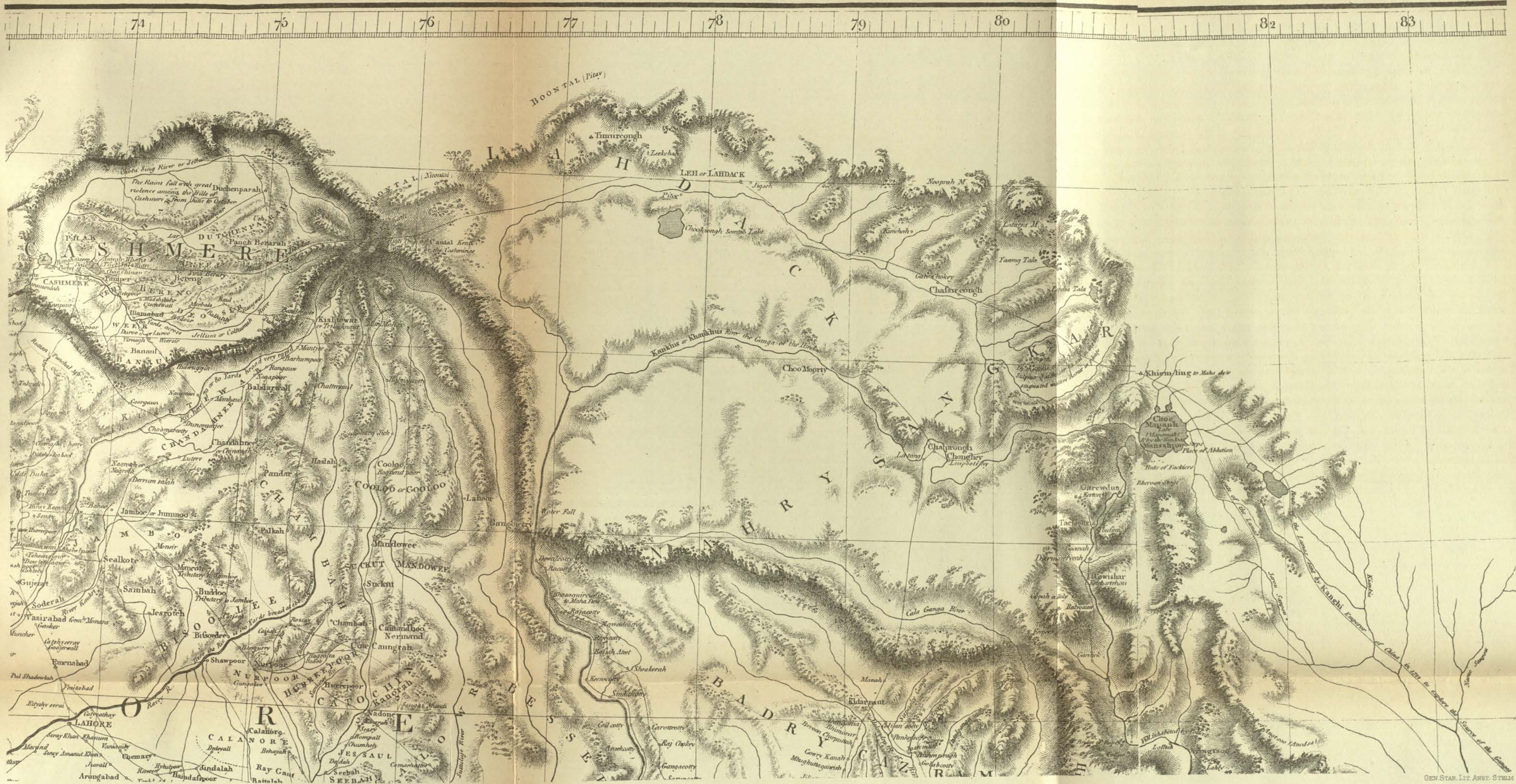
is a range called »Musart of Pallas». As we remember, Strahlenberg had placed the name Musart correctly as belonging to the Tian-shan.

It should be noticed that he uses the name Himlah Mounts covered with Snow, and that he correctly joins the Tsangpo and the Brahmaputra.

Much the same representation of the presumed source region of the Ganges, the hydrographical arrangement, and the part played by the river passing at Leh, is to be found on A. ARROWSMITH'S beautiful *Map of India* of 1804 (Pl. XVIII).¹ Here Lake Conghe which drains to the Sacred Lake, is removed to the S. E. of the latter. On the earlier maps discussed above it was placed east of the Sacred Lake, which may be said to be more in accordance with facts, provided that Lake Conghe is meant to be identical with Gunchu-tso as must, of course, be the case. It has been seen and surveyed by the Lama explorers and it is entered on d'Anville's map under the name L. Conghe. But as is seen on d'Anville's map, Pl. LI, Vol. I, he seems to have been in doubt regarding the communication between the Conghe Lake and Manasarovar. On d'Anville's map two small rivulets enter L. Mapama from the east, one northern and one southern, each coming from a little lake. Just east of the northern lake he has the L. Conghe, which also is situated east or rather E. N. E. of L. Mapama. But on his map of the whole of Tibet, Pl. I, Vol. III, he has an effluent from L. Conghe entering the little northern lake. All three lakes and all the rivulets are adopted on Arrowsmith's map. The only difference is that Arrowsmith has turned the whole presumed source region, lakes and rivers, some forty degrees to the south. To point out that this region has been surveyed by the Lamas the English cartographer has drawn the approximate route of these native explorers with a double line, one being the return journey. Both follow the source region of the Yaru-tsangpo; one is situated east, the other west of the Conghe Lake, and they join near Khiem-ling. The Kailas is missing altogether. The Sacred Lake and its neighbour are drawn in accordance with TIEFFENTHALER, except the mistake of the Lamas regarding the Ganges. The Rakas-tal, has no name. The Sacred Lake is called »Choe Mapanh Lake (Mapamah) & by the Hindous Mansahrar». The mountains north of the Leh or Lahdack River are sketched as on the maps discussed above.

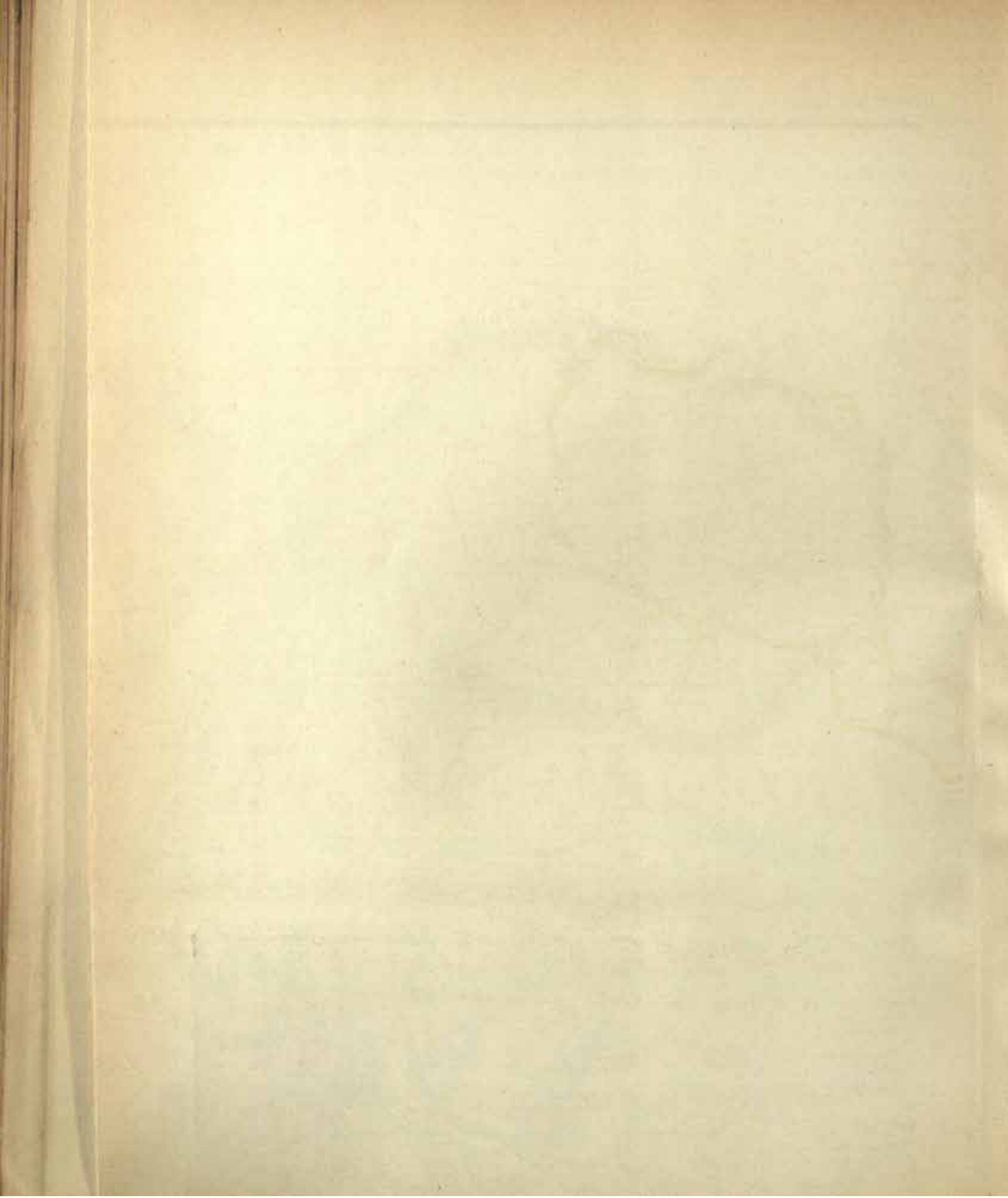
British geographers and cartographers occupied a leading position in Indian matters, and their German colleagues, therefore, used to follow their example. Such is the case, for instance, with the map reproduced here as Pl. XIX. The draftsman, H. C. ALBERS, positively says that his map is simply a copy of Arrowsmith's map

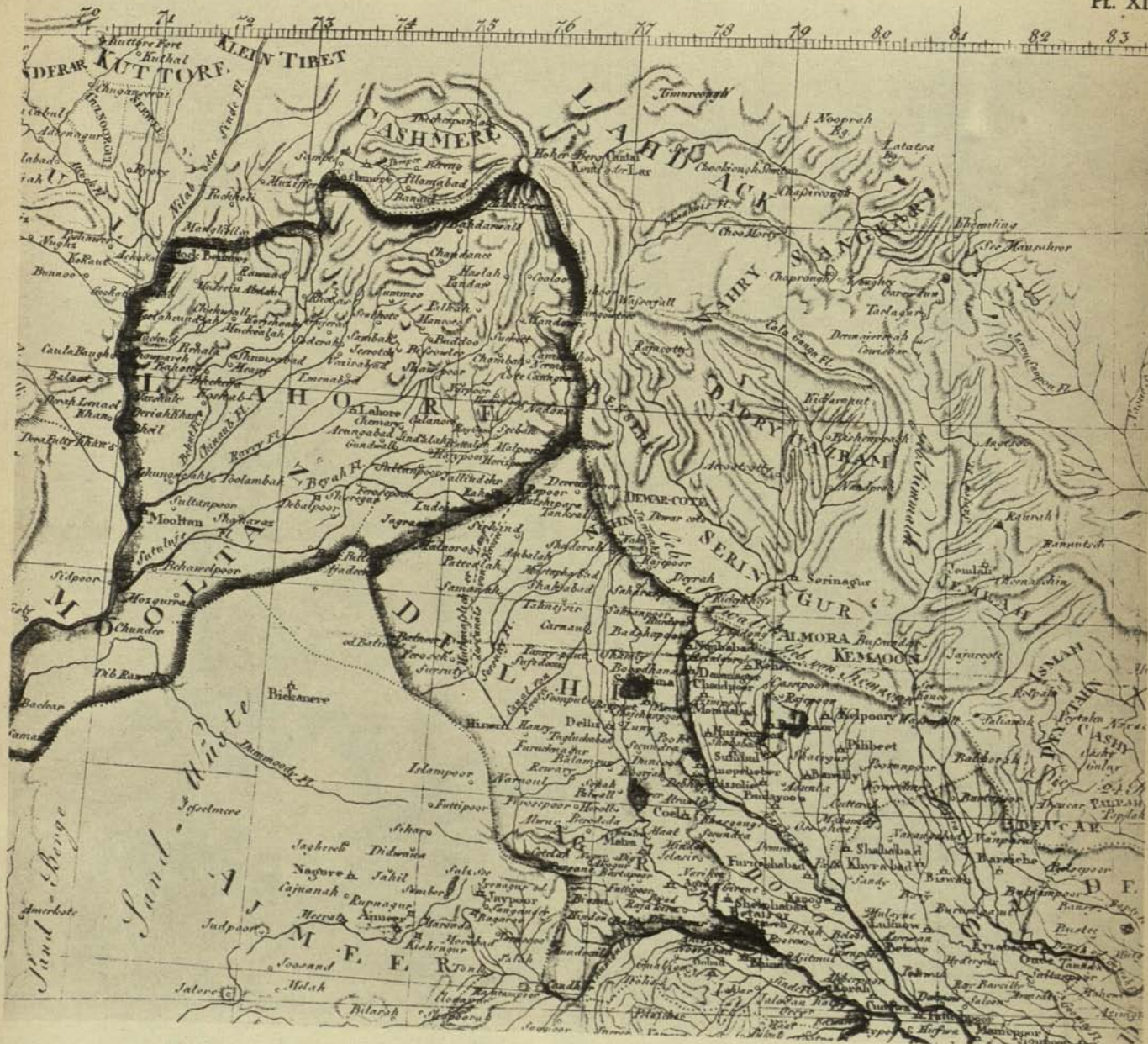
¹ Its complete title runs: *To Mark Wood Esq. M. P. Colonel of the Army in India Late Chief Engineer and Surveyor General, Bengal, This map of India Compiled from various Interesting and Valuable Materials Is Inscribed in grateful Testimony of His Liberal Communications By his obedient and most humble Servant A. Arrowsmith. 1804.*



Map of India by A. Arrowsmith, 1804.

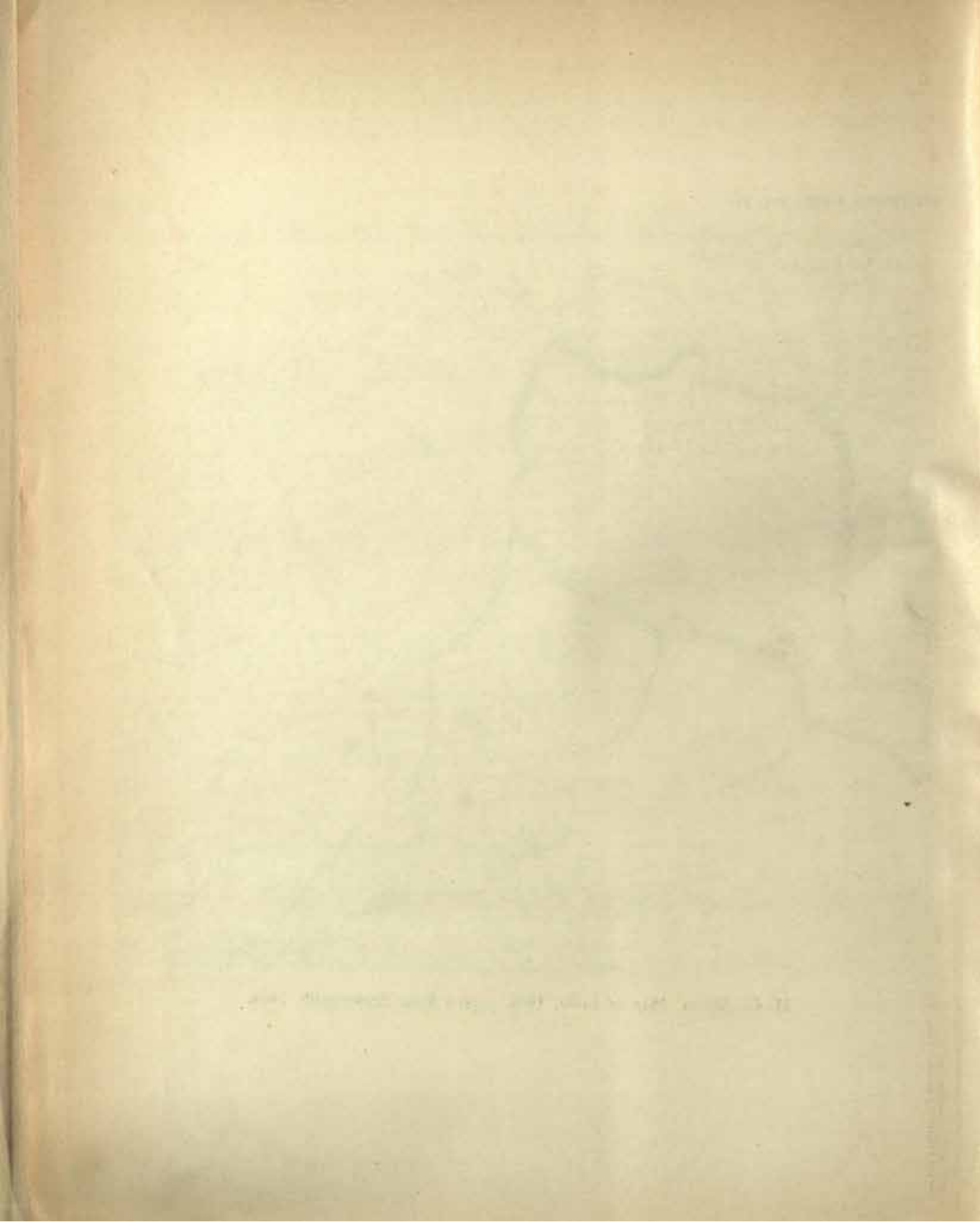
GEN. STAR. LIT. ANST. STEIN

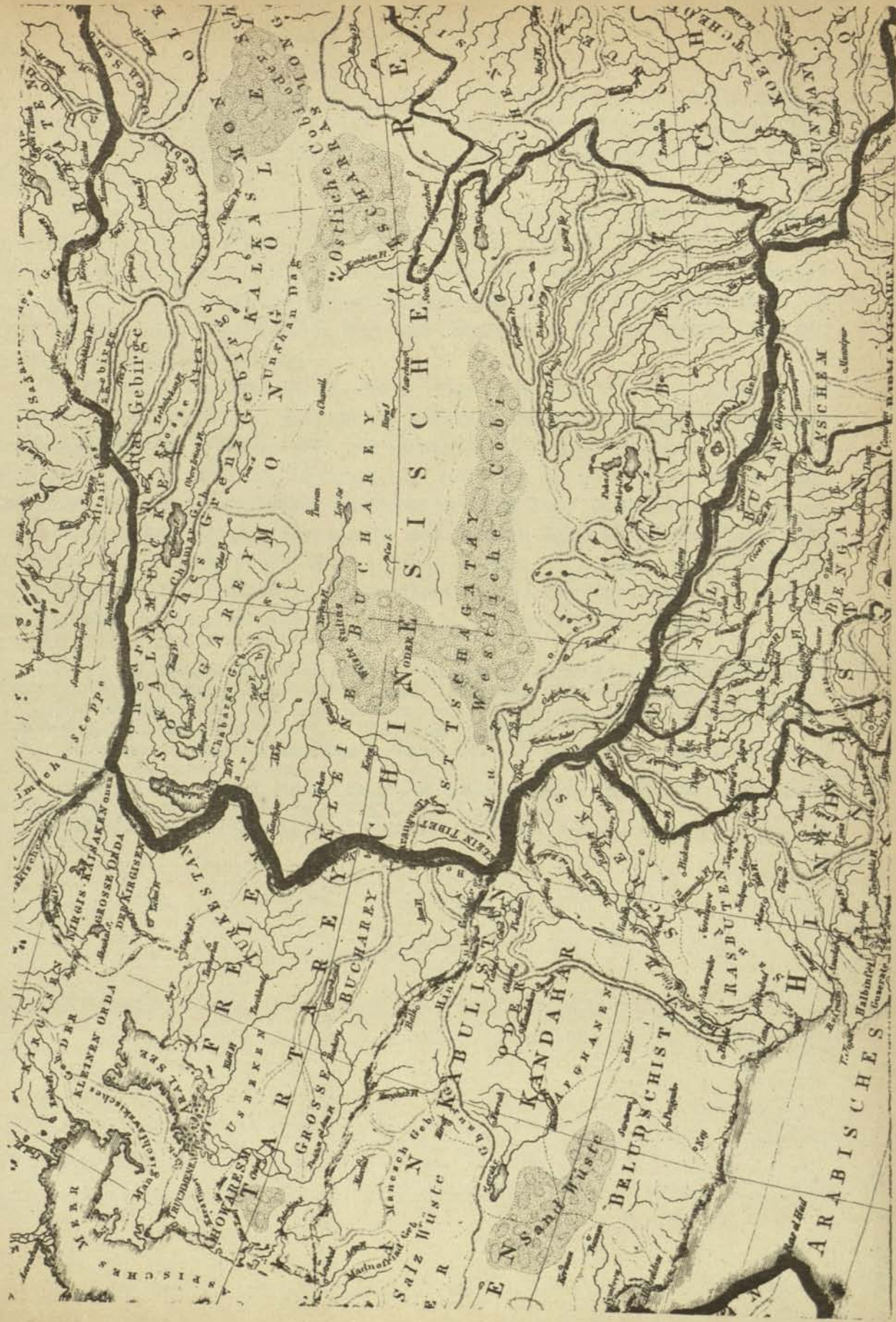




H. C. Albers' Map of India, 1806, copied from Arrowsmith, 1804.

GEN. STAB. LIT. ANST. STILM





Asien Gezeichnet von J. M. F. Schmidt zu C. Ritter's Erdkunde, Berlin 1819.

(Pl. XVIII), on a reduced scale.¹ Klein Tibet or Little Tibet is, as on the original, placed at both sides of the Indus, whereas this country, on Arrowsmith's map of 1801, was placed to the west of the Indus. This map is accompanied by a special explanatory text.²

The well-drawn map of K. J. KIPPERLING published at Vienna in 1809 is, on the other hand, chiefly constructed after RENNELL'S originals, and is of no special interest to us, as it does not reach farther north than the sources of the Tsangpo-Brahmaputra.³ Nor have I reproduced the little map of C. G. REICHARD, 1819, the single thing of interest of which is that lake Manasarovar has the legend: See und Ursprung eines Arms des Indus.⁴

Pl. XX is a reproduction of *Asien. Gezeichnet von S. M. F. Schmidt; zu C. Ritter's Erdkunde*, 1819. It shows an interesting attempt to join all the mountains surrounding Eastern Turkestan into one uninterrupted range, Mussart Gebirge to the north, Belur Tag to the west, Karangu Tag and Mus Tag oder Imaus to the south. Klein Tibet is bordered by Belur-, Karangu- and Mus Tag. Kantaisse Geb. is placed south of the joined Indus. The eastern and western branches of the Indus take their origin on the northern side of the Himlaya Gebirge. The source of the Tsang-po, on the other hand, is placed on the southern side of the Mus Tag. It is curious that the Imaus is identified with the Mus Tag and not with the »Himlaya«.

¹ *Charte von Ostindien diesseits des Ganges im gegenwärtigen Zustande nach Arrowsmith's neuester Charte in 6 Blättern verjüngt gezeichnet von H. C. Albers.* Gotha 1806. Coloured, 39×45 cm. 1:7200000.

About the same conception is to be found on another German map, *Charte von Asien.* Weimar, im Verlage des Geograph. Instituts, 1806, — though on a reduced scale.

² *Recension der Arrowsmith'schen Charte von Ostindien als erläuternde Beylage zu einer neuen Charte von Ostindien diesseits des Ganges.* . . . 32 pp. Gotha 1807.

³ *Hindostan nach Rennels grosser Karte und andern bewährten Hilfsmitteln entworfen von K. J. Kipperling.* Coloured, 48×61 cm. Wien 1809. 1:5400000.

⁴ *Ostindien*, entworfen u. gez. v. C. G. Reichard 1819 (Gotha, Perthes). Coloured, 33×27 cm. 1:18500000.

CHAPTER XIV.

ELPHINSTONE. — MIR IZZET ULLAH.

The first Europeans who brought us any certain knowledge of the Kara-korum were MOUNTSTUART ELPHINSTONE and other members of his mission. When Napoleon sent General Gardanne to Persia in 1808, and seemed to intend to carry the war into Asia, the British Government decided to send an embassy to the Amir at Kabul, and, as the Amir was known to be haughty, the mission should be equipped magnificently, and an excellent selection of officers should accompany it.¹ Elphinstone was the chief. The embassy left Delhi on October 13th, 1808. As so many able officers took part in this important expedition it was not surprising that it should bring back important geographical results.

The following quotations from his narrative will furnish an idea of Elphinstone's view regarding the mountains between India and Eastern Turkestan. The northern frontier of the kingdom of Kabul is formed by the mountains of the eastern Caucasus, which are, however, included within the western part of the boundary there formed by the Oxus.² Hindustan and Kabul are everywhere bounded on the north »by a chain of mountains which is covered with perpetual snow, for almost the whole of that extent,» and all the great rivers appear to issue from it. »From Brahmaputra to Kashmir it is called Hemalleh. From Kashmir it turns S. W. to the high snowy peak of Hindoo Coosh.... From Cashmeer to Hindoo Coosh, the whole range is known by the name of that peak.» Farther west to the meridian of Herat he uses the name of Paropamisus.

Elphinstone did not place the water-parting on the chain of mountains which, when seen from the southern side, could be supposed to form the natural boundary of Hindustan and Kabul. He understood that one has to look »farther north for the ridge that terminates the natural division, in which those countries are situated, and contains the remotest sources of their greatest rivers. — Our geographers

¹ Mountstuart Elphinstone: *An Account of the Kingdom of Caubul etc.* London 1815.

² Op. cit., pag. 84 *et seq.*

lay down a range of mountains under the name of Mus Tag, which seems to commence to the north of the eastern extremity of Hemalleh, and to run parallel to that mountain on the north, as far as the 67th degree of east long.»

The inquiries they made during the Cabul Mission only traced a small part of the extent of this range. Lieut. MACARTNEY followed it from Aksu to the west of Leh, »but the remaining part of its alleged course is probable, and though I have not access to the proofs of its existence, I have no reason to doubt it». He, however, takes the chain for granted and calls it Mooz Taugh. He translates the word correctly and says at least one place in the range is called so, namely, where this name »is occasioned by a glacier near the road from Jarcund to Laudauk. This range, or a particular pass in it, near the road just mentioned, is well known in Toorkistaun by the name of Karra-koorrum». Elphinstone thus suspected that the now so famous name of Kara-korum might easily belong to a whole range, and not only to a pass. And he believes that, although the Mus-tagh stands on higher ground than the Hindu-kush, its summits must be lower. »It is in the southern side of Mooz Taugh, that the Indus appears to have its source, and on the opposite side the waters run north into Chinese Toorkistaun». As Elphinstone regarded the Shyok as the source of the Indus, the above passage is perfectly correct and I think no European before him has expressed this truth.

He believes in the existence of a tableland south of the Mus-tagh, supported by Himalaya and Hindu-kush and from which the descent to the plains of Hindustan is comparatively sudden. He thinks it may be 200 miles broad, but he has no information of its eastern extension beyond the meridian of Ladak. »The eastern part of it is occupied by the extensive country of Tibet.» The general rule which we remember already from Ptolemy, *viz.*, that the knowledge becomes more vague the farther north, appears here as well. Elphinstone tells us that west of Tibet is Little Tibet and Kaushkaur, mountainous countries of no great extent. North-west of Kashgar he places the »plain of Pamere». The western face of the table-land is supported by a range of mountains, which runs from the chain of Mooz Taugh to that of Hindoo Coosh. This is called Belur Tag, »which is evidently a corruption of the Turkish words Beloot Taugh, or Cloudy Mountains». Not knowing any general Turki name for the range he calls it Beloot Taugh. It is the political division between independent Turkestan and Chinese Turkestan and it is the water-parting between the rivers of the two countries.

In Appendix D. there are some extracts from Lieut. MACARTNEY'S Memoir. He complains of the difficulty he had in finding out the real names of ranges and rivers. The name of Hindoo Koosh he regards, however, as settled, although it, in fact »is the particular name for one snowy peak of the ridge». The Pamir he regards as a ridge, not as a plateau.

The information Macartney could obtain, more than a hundred years ago, about the »Table-Land of Little Tibet and the Hills extending N. W. to Yarkand», could not be very great. He found out that a 5 days' journey N. E. of Kashmir an evident ascent commences, which is very considerable for 3 or 4 days, and then less to Leh. But he is right in concluding that this ascent continues on »to the great ridge which separates Tibet from Yarkand, as appears by the course of the stream which comes from that point». This ridge, he says, answers to the Pamir Ridge, and from his map it seems as if he regarded the Kara-korum and Pamir Ranges almost as one and the same fold, only with a little bit of the Beloot Taugh coming in between them. The road from Leh to Yarkand crosses it 15 days from Leh. On account of the country being perfectly desolate he could not get any information about it. But he is sure the whole country is excessively mountainous.

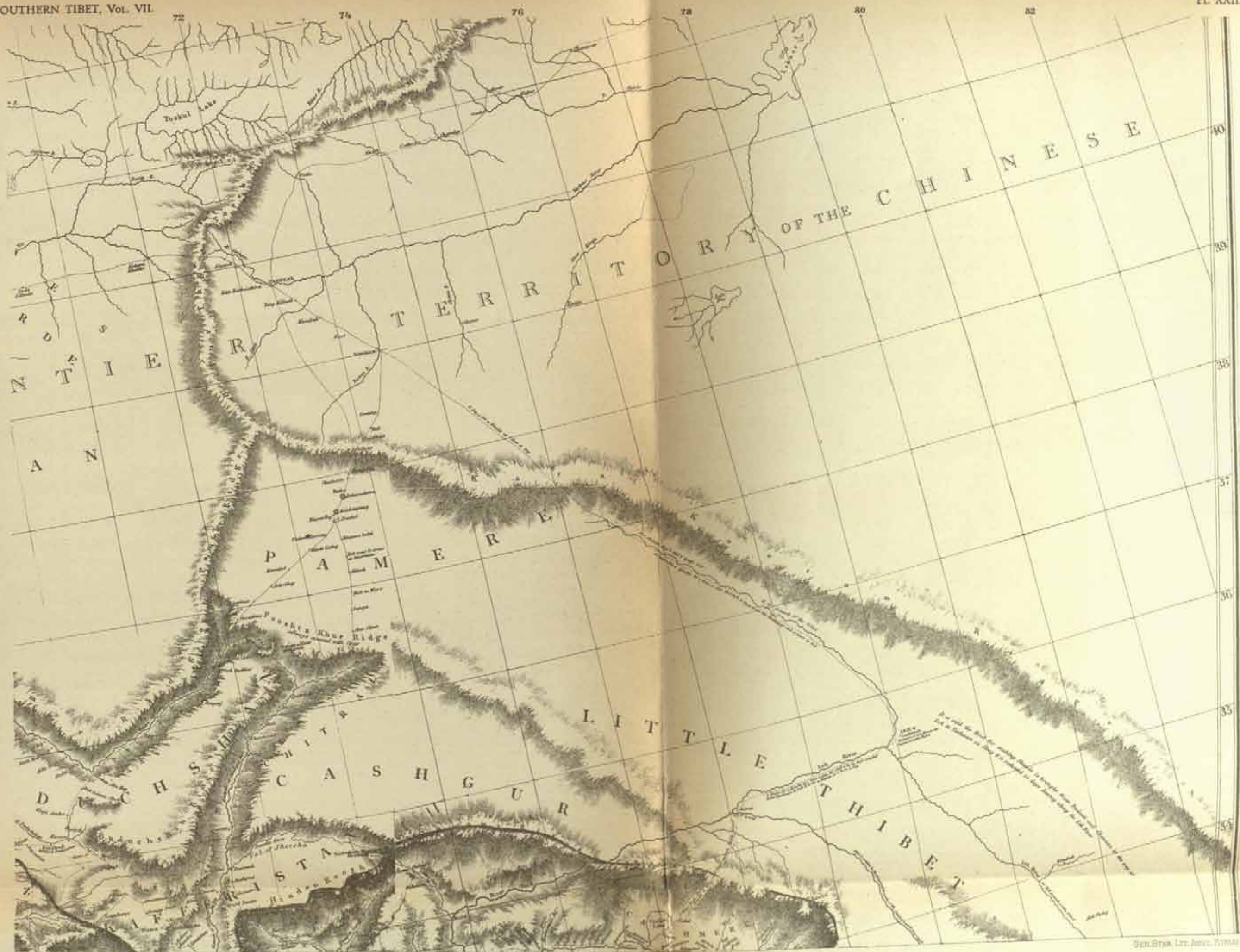
Lieut. Macartney's beautiful map to Elphinstone's work was »altered» from a map of 1809.¹ Here Leh is situated on the Ladak River to which the Shauyook comes from the N. W., after having followed the southern foot of the »Mooz-Taugh or Karra-koorrum Mts.». There is of course, and must be at such an early date, much confusion about the situation of the different countries and mountains. The country »Cashghar or Kaushkaur» is situated between the Kara-korum and Hindu-kush and is not to be confounded with the Kashgar of Eastern Turkestan, which is also entered at the northern edge of the map. Although even Sir HENRY RAWLINSON some sixty years later denied the existence of a Kara-korum Range, MACARTNEY has drawn such a range on his map as clearly as the Himalaya. A road coming from the south and passing the Surik-kol Lake crosses this range and divides at its northern foot, the left branch going to Cashgar, the right to Yarkand, after having passed Oortung (Örtang). But the road which follows the Shayok River up and crosses the Kara-korum Range diagonally, is quite another one on the map, although both these roads in reality are one and the same. However, it may be that the eastern road on the map corresponds to the Kara-korum road, and the western, as it passes the Kara-kol and Sarik-kol, may be meant as the Tagarma road from Pamir to Kashgar. To this points the name Tunjee Tar amongst the mountains of Mooz Taugh. Under such conditions the Mooz Taugh is the Kashgar Range with the Mus-tagh-ata, and Tunjee Tar is the Tenghi-tar, or »the narrow Passage», which I have described elsewhere.² Farther south on the same road the map has an Ak Tash, which, again, points to the ordinary Kara-korum road. But it is difficult to identify the two roads from these few names, as all three, Mus-tagh, Tenghi-tar, and Ak-tash, are rather common names in these regions.

¹ *A Map of the Kingdom of Caubul, And some of the Neighbouring Countries Altered from a Map constructed in the year 1809.* By Lieut. John Macartney, 5th Reg. Bengal Native Cavalry. — Pl. XXI is a reproduction of the N. E. part of this map.

² *Through Asia*, Vol. I, p. 264 et seq. Cf. above p. 40 and Vol. VIII.



A Map of the Kingdom of Caubul by J. Macartney, 1815.



Outlines of the Countries between Delhi and Constantinople, by
A. Arrowsmith 1814. Additions to 1816.

To judge from Macartney's map and from Elphinstone's text, they did not at all know the existence of the Kwen-lun, although these mountains had been known by the Chinese some two thousand years, partly under the name of Ts'ung-ling.

Anyhow the map is of great interest and value, throwing bright light on the desperate searching for truth, and as a proof of conscientious desire to bring out the chief geographical features in a country not yet visited by any Europeans. It is also important as a first attempt to broaden out Tibet to its real breadth. From classic times the Emodus Montes had kept their ground as one single range. On STRAHLENBERG'S map there was only an Imaus, on RENAT'S only a Mustack. D'ANVILLE had made it very likely that the mountainous country here was much broader, as later on was clearly shown on MACARTNEY'S map. He obviously supposed that his Mooz Taugh or Kara-korum was the boundary to Chinese Turkestan, or rather to Yarkand and Kashgar, as he reckons Chinese Turkestan both north and south of the range.

Whilst Macartney, as we have seen, on his map of 1815 identifies the Kara-korum with the Mus-tagh, A. ARROWSMITH on his map *Outlines of the Countries between Delhi and Constantinople* 1814, with additions to 1816, from which Pl. XXII is reproduced, — has only one name for the range which, here as well as on Macartney's map, is the water-parting between the Shyok-Indus and the Yarkand River-Lop-nor, namely Kara Koorum Ridge.

We now come to the first reliable traveller MIR IZZET ULLAH¹ who has given us a very good description of the Kara-korum road.

His narrative is re-published in 1843 by H. H. WILSON, who makes reference to the travels of BURNES, MOORCROFT, WOOD and VIGNE. When Wilson says that it was in 1812 that MOORCROFT dispatched MIR IZZET ULLAH on a preparatory tour to the countries which Moorcroft purposed to visit himself, he is of course right, and »1812« only looks like a misprint, for, when in Leh, Moorcroft says:² »Immediately after.... I dispatched Mir Izzet Ullah to Yarkand to further the negotiation going on there for permission for us to proceed, and, pending the result continued my investigations in the neighbourhood.«

But, on the other hand, Mir Izzet Ullah has obviously been sent to Yarkand twice by Moorcroft, for the latter says in his first chapter, concerning the start in October 1819:³ »Mir Izzet Ullah, a native gentleman of talent and information, who

¹ *Travels beyond the Himalaya*, by Mir Izzet Ullah. Republished from the Calcutta Oriental Quarterly Magazine, 1825. *Journal of the Royal Asiatic Society of Great Britain & Ireland*, Nr. XVI. London 1843, p. 283 *et seq.* The article in the *Calcutta Magazine* was WILSON'S translation from MIR IZZET ULLAH'S original, written in Persian. Wilson's article was translated into French and published in the *Magazin Asiatique*, Juillet 1826. It also appeared in Ritter's *Asien*, II.

² *Travels etc.* . . . I, p. 422.

³ *Ibidem*, Vol. I, p. 2.

had preceded me a few years before on the route I purposed to follow....» And Wilson adds: »Mir Izzet Ullah was sent by Mr. Moorcroft, in 1812, to explore the route to Bokhara, via Yarkand.» In 1812 Moorcroft was at Manasarovar. The question would not be of any consequence, were it not for getting a sure date of his passing the Kumdan Glaciers. At any rate we find that Mir Izzet Ullah had been at Yarkand once a few years before 1819, *i. e.* about 1812, and once during Moorcroft's stay in Leh from September 1820—September 1822.

It was on his journey of 1812 he wrote his diary, for Wilson says:¹ »In the year 1812, Mir Izzet Ullah, a servant of the enterprising and enlightened traveller Mr. Moorcroft, was dispatched on a preparatory tour to those countries which Mr. Moorcroft purposed to visit at a favourable period. Izzet Ullah travelled from Delhi to Kashmir, from Kashmir to Tibet, from Tibet to Yarkand, from Yarkand to Kashgar, thence to Kokan, from Kokan to Samarkand, thence to Bokhara, Balkh, and Khulm, and from Khulm to Kabul by way of Bamian, whence he returned to the plains of Hindustan.»

From this Mohammedan pioneer's narrative we are told that the river Shayok »rises in a mountain between Tibet and Yarkand,» and this mountain is Kara-korum, as we know. About Ladak we are told: »In Kashmir they called the country Buten and the people Bot; and in Persian and Turkish the country is called Tibet, the word Tibet signifying in Turki shawl-wool, which is procured here most abundantly, and of the finest quality.»

Of the heading: »From Tibet to Yarkand», Wilson says: »This part of Izzet Ullah's route is entirely new, as Marco Polo and the missionary Goetz who visited Yarkand, both went by a different route, or through Badakhshan. The other missionaries who penetrated to Lé, turned off thence to Lassa.» These are DESIDERI and FREYRE. As I have mentioned above,² Wilson also knew Yefremof's journey.

In Wilson's translation it is said that Mir Izzet Ullah »arrived at Lé on the 30th of October 1812,» and a few lines lower down that he »left Lé on the 26th of October, and set off for Yarkand». One of these dates is wrong unless he stayed over a year in Leh. It is, however, important to have the season of the year.

He takes the road of Diger and comes down to Shayok. »In summer time the road to Yarkand is by Nobra, for the lower levels are rendered impassable by melting of the snows.» His description of the road and its crossing the river at so many places, is very good. He mentions some names which are still, after 100 years, in use, as *f. i.* Chong Jangal and Kester Khaneh. At Dong Ba-ilak³ he saw »a rock of marble, which extended for a gunshot, that terminated in a striped rock like Sulimani stone». So he even made some geological observations!

¹ *Journal Royal Asiatic Society*, 1. c., p. 284.

² *Vide p. 108, n. supra.*

³ Dung-balik?

The names Mandalik and Kotak lak (Köteklik) are still in use. »This is one of the feeders of the Shayuk, which river here loses this appellation, and is called the River of Khamdán,» — in which we recognize Kumdan. Then follows Chong Tash and he observes an opening to the left, »turning towards the south, passing through which a mountain is crossed. They call that road of Sisar.» VIGNE, proceeding to the head of the Nubra valley, later on mentions the Saser route, confirming MIR IZZET ULLAH.

What he says of Khamdán (Kumdan) is of interest. His station was on the river, so that the glacier seems to have been unusually far back. »On our left hand between the south and west is a mountain of ice, which remains unmelted throughout the year. They say it is two hundred cos in extent, and on one side is Tibet Balti, and on the other Serkul, on the boundaries of Badakhshan. From Kashmir to Yarkand, through Balti, it is a journey of twenty-five days, three of which are over this glacier, and it is, therefore, rarely travelled. There is said to be also a shorter road, avoiding the icy mountain, but the people of Tibet keep it a secret. Large blocks of ice, some of a spiral form, were lying about the station: perhaps the place derives its name from this, Kham, a spire or curl. They say that this ice shifts, for the people of the country observe that a particular stone, which at one season is on the side, is after some time observable at the summit of the mountain. Moreover the water which bubbles at the lower part having become ice, pushes up and takes the place of the ice above it. In some places the colour of the glacier is white, in some it is of the colour of jasper (jade), in some like water, and others like the sky.»

ELPHINSTONE notices that Mir Izzet Ullah regards the Khamdán as a separate mountain of ice, and Wilson infers »that the glacier here met with, is in fact part of the Mustak range». None of them had visited the place.¹

The way to Yápchán goes »on both sides the river; the road was irregular, and the snow lay a foot and a half thick».

So much seems clear from Mir Izzet Ullah's description, that he did not at all come in contact with the ice. But as the road was on both sides of the river it seems to have been cut in some places by the projecting snouts of the Kumdan Glaciers. If he had touched the ice anywhere he should have mentioned the ice instead of the snow. At any rate the Kichik Kumdan stood at his visit, in 1812, farther back than I found it 90 years later or in 1902.

¹ KLAPROTH has paid special attention to this passage and quotes Elphinstone's view in the following words. »Ce lieu devrait donc être plutôt au sud-ouest qu'au sud-est, et le mot de mechrek (est) peut être une erreur de copiste. Elphinstone parle de ce passage du journal d'Izzet Ullah. Il observe que ce voyage décrit le glacier de Khamdán, non pas comme faisant partie de la chaîne de montagnes, mais comme étant un mont de glace séparé et situé à gauche de la route, à deux journées avant d'arriver à Kara-korum et s'étendant à 200 coss du Tübet Baltu à Sarikol.» *Magasin Asiatique*, Tome II, Paris 1826. *Voyage dans l'Asie Centrale*, par Mir Izzet Ullah, en 1812, p. 21.

To the south of Kara-korum he found a stone shelter for travellers. »The source of the river Shayuk is on the south of Kara-kúrúm, on the north is that of the river of Yarkand.» Wilson adds: »The Shayuk rises by two heads, one from the snows on the southern face of the Karakurum range; the other from a lake in the same position a little more to the west, called Nobra Tsuh. See Vigne's map.» The story about the lake was later on proved to be wrong.

On the northern side of the Kara-korum he mentions a station with 2 or 3 houses, Sarigh-out (Sarík-ot). Other names are Akták, Khafalun, before which the road to »Kalian in Kokiar» is passed, Taghneh, Igersáldi, Bagh-i-Hadji Mohammed, Yártobi and Yanghi Dawán. »There is another route by Chiraghsaldi mountain, but it is longer by a two days' journey than this. The road to Yanghi Dawán has been known for sixty or seventy years.»

Finally he comes out at Kokyar. He gives a rather short description of the Kwen-lun, but what he says of the Yangi-davan made it probable to his readers that he was at a considerable height on this pass.

These are the chief and most important contents of Mir Izzet Ullah's journal, so far as the Kara-korum road is concerned. Remembering that it is the narrative of a native, it is very good. He is the first reliable traveller across the Kara-korum we know of, and he leads the long series of explorers who since his days have travelled this way. His exploration also says a good deal in favour of Moorcroft, who, some fifty years before Montgomerie, understood that natives could be used for exploration. It is also to his credit that such a clever and intelligent man was sent out.

Before Elphinstone published his narrative he had an opportunity to study the results of Mir Izzet Ullah, which, however, did not change his own views at all. He finds his narrative »highly interesting» and makes a detailed extract from it. I only quote the following:¹ »though Izzet Oollah does not speak of the range of mountains at Karrakoorrum as exceedingly high, he gives a frightful picture of the cold and desolation of the elevated tract, which extends for three marches on the highest part of the country between Yarkand and Ley It is obvious that this account of the Indus agrees entirely with Mr. Macartney's, except that it makes the Shauyook have its source in Mooz Taugh, and not in the lake of Surik Kol.»

¹ *An account of the Kingdom of Caubul, etc.* London 1815, p. 111 et seq.

CHAPTER XV.

WILLIAM MOORCROFT.

In his preface to MOORCROFT'S second journey, WILSON gives a good *résumé* of the knowledge in Europe about our region, as it was in 1841¹:

The whole of the intervening country between India and China is a blank; and of that which separates India from Russia, the knowledge which we possess is but in a very slight degree the result of modern European research, and for the most part either unauthentic or obsolete. The statements of Chinese geographers, or the details to be gleaned from Persian historians and biographers, are calculated only to be a substitute for accuracy, and are preferable alone to utter ignorance; and the travels of Carpini, Rubruquis, Marco Polo, and the Jesuit Missionaries, even if they were more comprehensive and trustworthy than they are, were performed under circumstances not less different from the present in Central Asia than in Europe. Such authorities, therefore, are wholly inadequate for the demands of the present age, and, except in a few of the great unalterable landmarks of their several routes, leave, as it were, still undescribed some of the most interesting countries of the East.

He expresses a wish that the Government of India should cooperate with Russia in dissipating the mist which still (1841) enveloped the geography of these regions.

And then he turns to MOORCROFT, whose ambition it was to penetrate into Turkestan, the country of a breed of horses which he would domesticate in India. To prepare his way he sent MIR IZZET ULLAH before. Moorcroft started in 1819 accompanied by Mr. GEORGE TREBECK.

On new roads he travelled to Leh. His information about this town is »entirely new in the annales of geographical research«. And Wilson adds that GERARD'S results »by no means supersede the labours of his predecessor«, they only confirm the observations of Moorcroft and Trebeck. Moorcroft reached Leh in September, 1820, and remained two years. His wish to visit Yarkand was refused by the Chinese authorities. Unsuccessful in this direction and without assistance from the

¹ *Travels in the Himalayan Provinces of Hindustan and the Panjab, in Ladakh and Kashmir; in Peshawar, Kabul, Kunduz, and Bokhara*; by Mr. William Moorcroft and Mr. George Trebeck, from 1819 to 1825. Prepared for the Press, from Original Journals and Correspondence, by H. H. Wilson, Prof. Sanscrit, Oxford. London 1841.

Government of India, he travelled *via* Kabul to Bokhara, on a road new to Europeans. Only BENEDICT GOËS had travelled from Kabul to Kashgar.

In Moorcroft's diaries there are some references to the Kara-korum Mountains which demand our attention, »Ladakh is bounded on the north-east by the mountains which divide it from the Chinese province of Khoten, and on the east and south-east by Rodokh and Chan-than, dependencies of Lassa The north is bounded by the Karakoram mountains and Yarkand.»

He gives a very good general description of Ladak and proves to have been rather well informed regarding its eastern part. »The Shayuk is the principal river that joins the Indus on the north. Rising from the foot of the Karakorum mountains, it flows several days' journey to the south till within two days' journey to the north-east of the village of Ahkam. There it receives the Duryukh, a river that collects the waters from the eastern portions of the northern valley» He collected some information about the trade with Lhasa and Yarkand. »The Garphan is the chief of Chan-than. Rodokh is a province north of this and along the lake of Pangkak. The people are chiefly shepherds, who subsist by the sale of their wool to the merchants at Le. From Rodokh a road is said to cross the mountains to Khotan, and the journey is one of three or four days only. All attempts, however, to reach Khotan by this route are rigidly repressed by the Chinese.»

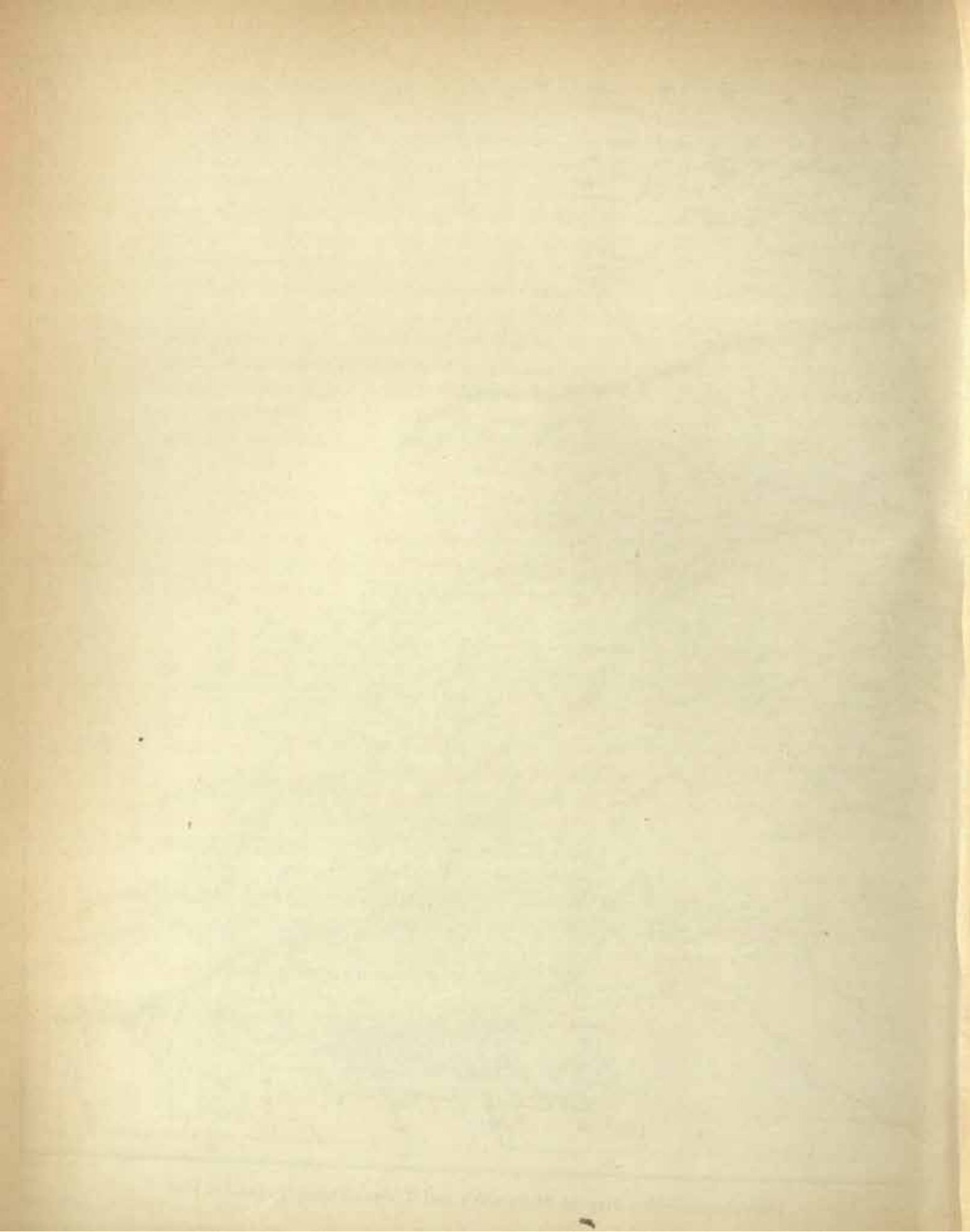
He gives a description of Yarkand, which had been visited by MARCO POLO and MIR IZZET ULLAH — nothing else was known about it at that time. »On the north Ladakh is bounded by the Pamer or Karakorum mountains, a very rugged and difficult road through which leads to the province and town of Yarkand or Yar-kiang.» WILSON mentions TIMKOVSKY and BURNES for further information about Yarkand.

»Eastward from Yarkand, and separated by lofty mountains on the south, a continuation of the Karakoram chain, is the district of Khoten. . . .» He did not know, in spite of Mir Izzet Ullah's journey, the existence of the Kwen-lun System, thinking the Kara-korum was directly on the south of the Khotan province.

The Yarkand River »rises in the northern face of the Karakoram chain, and after running to the north-west some way, is joined on the west by the Serakol river, a large branch from the Karakol Lake in the Pamer mountains, and then takes a bend to the east, past the city of Yarkand.» Regarding the Tarim System he has unreliable information. It is interesting to notice Wilson's footnote on the subject. He remarks that all the maps represent the Yarkand River as terminating in »the small lake of Lop». But he finds it »scarcely probable that the lake of Lop absorbs the waters» of such a considerable river as the Yarkand and all its tributaries. If he had known STRAHLENBERG'S great map, which had already been quoted by HUMBOLDT, he would have obtained some support from it, for there is no Lake



John Arrowsmith's Map of Moorcroft's and Trebeck's journey, London 1841.



Lop at all. Already 100 years earlier RENAT had brought back a very good map of Eastern Turkestan and the Tarim System, but it was unknown to Wilson as well as to everybody else of his time.

During his stay at Leh, MOORCROFT made several excursions. Once he went *viâ* the Diger pass to Nubra, where he found 167° in the hot springs. Another time he travelled to Nimo (Niemo). For Indus he always uses the correct name, Sinh-kha-bab (Singi-kabab). *Viâ* Jimre and Takti he went to Chang-la, and estimated the height of the pass at 17,800 feet.¹ The water of the »Pangkung lake» was found to be extremely salt. TREBECK crossed the Tsaka-la, which was estimated at 15,000 feet.² On the other side was the valley of the Sinh-kha-bab between low and rounded hills, consisting »apparently of clay-slate, although fragments of granite, quartz, and sandstone were strewn upon their sides». November 23rd they commenced the return journey to Leh, *viâ* Chushal and the Man-bar pass, estimated at 16,500 feet.

In general it may be said that the second journey of Moorcroft was, as a geographical performance, less rich in detail and far less important than the first one, to Manasarovar. Mr. JOHN ARROWSMITH, who constructed the map from TREBECK'S fieldbooks, found these minute, careful and accurate (Pl. XXIII).³ The survey was made in paces, bearings by compass; barometer and thermometer read at principal elevations. In the compilation other maps were also used, *e. g.* Baron HÜGEL'S, Dr. GERARD'S, and others. It is, however, curious that Moorcroft and Trebeck, and with them Arrowsmith, could ignore the existence of a Kwen-lun System. They could easily have misunderstood the Chinese geographers, but the verbal description of Mir Izzet Ullah ought to have given them reason to suspect one more very considerable mountain system north of the Kara-korum.

»Yagni Dawan» (Yangi-davan) is on the map, although placed only in a very small range, at the southern part of which is the Yarkand-river. They are correct in making the river begin from the Kara-korum mountains, but they are not aware of its piercing through another high range farther on. The Pamir was too little known, as is seen on the map. The Kara-kul Lake is marked out with R. Yaman-yar going to the Kashgar River. Sir-i-kol is a little place and there is hardly any sign of the high Kashgar Range bordering the Pamirs to the east. In a little lake called Sir-i-kol is the »Source of the Oxus».

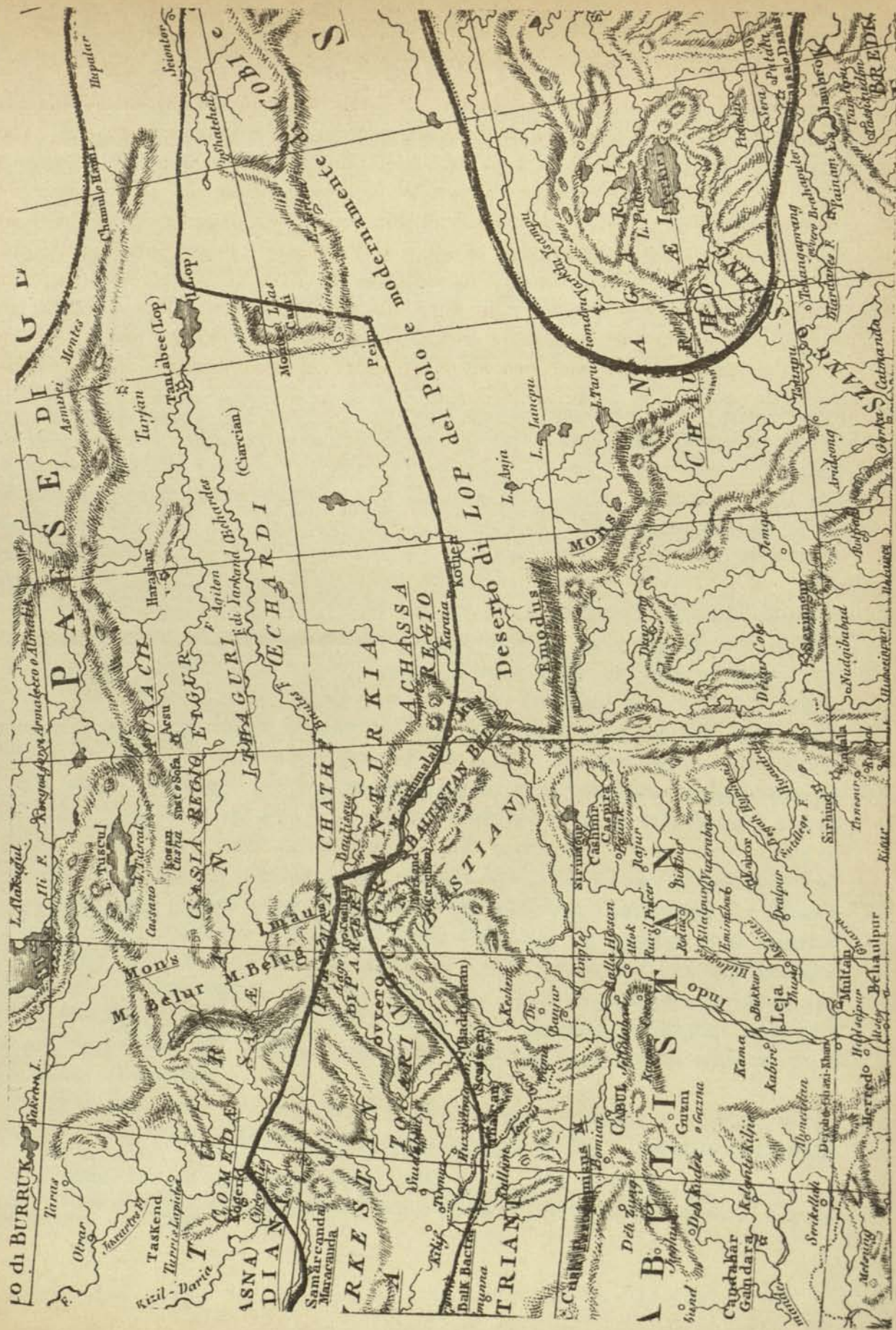
The most interesting features of the map are: The non-existence of Kwen-lun, the Kara-korum being regarded both in the text and on the map as the southern

¹ Or 5,427 m. In December 1901 I found it to be 5,360 m.; in August 1906 I found 5,355 m. MOORCROFT'S estimate is, therefore, very nearly correct.

² Or 4,573 m. I found it to be 4,653 m.

³ The title of this map is: *Map of the Himalayan Provinces of Hindustan, the Punjab, Ladakh, Kashmir, Kabul, Kunduz & Bokhara. To illustrate the Travels of Moorcroft & Trebeck, Constructed from their Original Field-Books and Notes by John Arrowsmith, 1841.* — Op. cit., Vol. I.

boundary of »Chinese Tartary»; and — the representation of the main branch of the Indus. On the Upper Shayok there are some names, difficult to recognize. They may have been misunderstood from Mir Izzet Ullah's verbal report. The uppermost part of the Shayok is running almost W.-E. between Yapchan and Sassar, both names correctly written. From Yapchan the road goes directly up to the Karakorum Pass, on the northern side of which is Barangsar. From Sassar to Yapchan the road is marked along the Shayok, crossing the river at five places. But of the Murghu road there is no trace at all. This proves clearly enough that Mir Izzet Ullah did not hear of the Murghu road, or, at any rate, did not use it, showing that the Kumdan road was open in 1821, as it had been in 1812. At that period the glaciers were in a period of retreat.



CHAPTER XVI.

THE DECADE 1818—1828.

In this chapter I have brought together some extracts of the writings of learned geographers, who, with only one exception, have not been in Asia themselves. The quotations given here are few, but quite sufficient to afford a clear idea of the state of knowledge regarding the regions around the Kara-korum Mountains as it was during the decade from 1818 to 1828. To the same period belong several of the geographical works of the great German scholars, KLAPROTH, RITTER, and HUMBOLDT, which are to be discussed in subsequent chapters.

When WILLIAM MARSDEN published his edition of MARCO POLO in 1810, he had great difficulties to get the narrative of the Venetian to agree with the geographical maps existing at the time. The mountains of Belur, Bolor, he finds on STRAHLENBERG'S map, from which he thinks they have been borrowed by D'ANVILLE, but in some respects the narrative is easier to fit in with the help of the new maps of the time, amongst which was MACARTNEY'S (Pl. XXI). Marsden says: »This alpine region named by eastern geographers Belûr or Belôr, is laid down in Strahlenberg's map, from whence, apparently, it has been transferred to those of d'Anville; but its position relatively to Pamir and Badakhshan will be found still more conformable to our author's account, in the recent constructions of Macdonald Kinneir and Macartney.»¹

The map accompanying Marsden's work has been constructed by Messrs. Walker & Sons under the direction of Major RENNELL. It is sufficient to mention that on this map the Mûz Mts. are placed east and E. S. E. of Pamir, and the Belor Mts. south of Pamir and S. W. of the Mûz Mts. North of Himalaya is Latak and Tibet, the latter rather narrow, whilst Kobi is exaggerated in breadth and goes down to 32° North. lat., a feature which we remember from several other maps of this period, and earlier.

Four years later, or 1822, Count G. B. BALDELLI published a map of MARCO POLO'S journey which is indeed rather surprising (Pl. XXIV).² I reproduce it only as

¹ William Marsden: *The Travels of Marco Polo etc.* London MDCCCXVIII, p. 144.

² *Carta itineraria de' viaggi de' Poli per servire all' Illustrazione del Milione Commentato e Pubblicato dal Conte G. B. Baldelli, Firenze 1822.*

a curiosity to show in how high a degree a mapmaker still so late as in 1822 could disregard well-known facts. In Eastern Turkestan the nomenclature of PTOLEMY is used. Cashgar is placed at the upper course of the river Bautissus or Bautes, *i. e.* F. di Yarkand (Oechardes), whilst Yarkand is placed on the Upper Indus and at the S. W. base of the Himmalah or Mus Mountains. Yarkand is thus situated between Vocan (Vakhan) and Baltistan. Himmalah constitutes the southern boundary of Eastern Turkestan, Kothen and Deserto di Lop del Polo e modernamente di Cobi e dai Cinesi Chamo, are placed east of Himmalah. South of Himmalah we find Emodus Mons, south of it, Dsaprong and still farther south, Serinagur. East of the latter is Szang or Sciang, Hor, Terkiri lake, which is supposed to be in »Nagari». West of Cashgar is Pianura di Pamer, and north of the latter Mons Imaus and M. Belur, M. Belugh Tag. Count Baldelli seems to have been very ignorant of the state of geographical knowledge of Central Asia at his time. D'ANVILLE'S map, which was nearly a hundred years older, must have escaped his attention.

If this mapmaker had only read MALTE-BRUN'S essays on these regions he would never have published his map. In a learned and very able article Malte-Brun makes a comparison between ancient and modern geography.¹ He has made use of the recent results of English exploration and by means of all the material existing at his time he sketches the principal mountain ranges north of India. A few passages of this article are worth remembering especially as they give such a distinct representation of what was really known in 1819.

L'Himalaya, venant des sources du Gange et de la Djemna, enveloppe le Cachemyr qu'il sépare du Petit-Tibet, traverse le cours de l'Indus, et prend dès-lors le nom de Hindou-Kosch ou Caucase indien, borde le Kafiristan, et, après avoir séparé le Caboul de la Grande-Boukharie, s'abaisse sous le nom de Parpanischa ou Paropamisus vers le plateau de la Perse.

L'Himalaya est, sans contredit, le pied méridional du grand plateau de l'Asie centrale; mais, lorsqu'un rapport des voyageurs indiens affirme qu'au nord de l'Himalaya il n'y a ni rivières ni vallées, mais seulement de vastes plaines désertes, il ne faut pas prendre cette donnée dans un sens trop général; ces voyageurs n'ont voulu parler que d'une portion du Petit-Tibet, au nord-est de Cachemyr. Il faut bien, d'après l'ensemble de toutes nos notions, admettre une seconde grande chaîne, un second degré du grand plateau central.

C'est le Kentaïsse des cartes chinoises qui borde le lac Manasarovar au nord, sépare le Petit-Tibet des parties inconnues du Grand-Tibet, et vient, sous le nom de Mous-Tagh, se diriger au nord-ouest entre les deux Boukharies. Le Père Georgi affirme qu'au nord des monts Kentaïsse s'étendent de vastes plateaux; les dernières relations de voyageurs indigènes à Caboul, recueillies par Elphinstone, attestent aussi que le Mous-Tagh borde les plateaux de la Petite-Boukharie; mais on n'a que des détails vagues sur les monts Karakoureen, qui, selon Elphinstone, doivent lier le Kentaïsse et le Mous-Tagh. C'est très-vraisemblablement le Karangoutak de Schereffeddyn. Un défilé conduit à travers la

¹ Malte-Brun: *Mémoire sur l'Inde septentrionale d'Hérodote et de Ctésias Comparée au Petit-Tibet des modernes. Nouv. Annales des voyages.* Tome II. Paris 1819, p. 307 et seq.

chaîne du Mous-Tagh de la plaine Pamer à Yarkand et à Cachgar. Au nord-ouest de ce défilé, la chaîne mieux connue s'unit aux montagnes de la Songarie.

C'est entre ces deux grandes chaînes que les cartes d'Elphinstone tracent un chaînon dirigé du sud-sud-ouest au nord-nord-est, et qui lie l'Hindou-Kosch au Mous-Tagh. Elphinstone lui donne le nom de Belour-Tagh, et croit que c'est le Belor de Marc-Paul et d'autres voyageurs anciens; mais il résulte du récit de Marc-Paul, que l'on n'entroit dans le pays de Belor qu'après avoir traversé la plaine Pamer, ce nom paroît donc désigner le Mous-Tagh, et il semble qu'on devrait donner à la chaîne intermédiaire, entre l'Indou-Kosch et le Mous-Tagh, le nom de monts Pamériens, à moins qu'on veuille leur assigner celui de Div-Saran, montagnes des génies noirs que les Persans paroissent lui avoir donné, et qui rappelle évidemment les Siah-Poushes ou peuples aux vêtements noirs habitants de la partie méridionale de cette chaîne.

C'est dans le triangle formé par l'Himalaya, le Mous-Tagh et les monts Pamériens, que l'Indus a ses sources.

Le fleuve venant de Ladak et celui qui vient de Gortope sont les deux sources les plus orientales de l'Indus que l'on connoisse. Le premier reçoit encore du nord-ouest une rivière tributaire nommée Chauyock. Le fleuve formé de la réunion de ces rivières franchit, à un endroit nommé Moullah, la chaîne de l'Himalaya et, à partir de ce point, le nom de Sindh ou l'Indus ne lui est plus contesté.

Au nord et au nord-ouest de l'Oun-Dès s'étend la principauté de Ladak ou Leh, communément désignée sous le nom de Petit-Tibet, envahi en 1628 par une armée indomongole, sous Zouffer-Kan, mais qui ne fut visité par des Européens que dans l'an 1715. Le père Desideri, un des intrépides jésuites qui y pénétra, lui donne aussi le nom de Baltistan. Entouré de rochers d'une affreuse nudité, des vallées, ou plutôt des ravins presque toujours couverts de neige, y produisent à peine un peu d'orge. Le voyageur passe avec effroi les torrens écumeux sur des ponts fragiles et flottans, formés de branches d'arbre entrelacées.

Le Khauschkaur ou Kaschgar méridional est encore très-peu connu. Les habitants s'appellent Kobi, vivent la plupart sous des tentes, et, obéissent à quelques petits seigneurs ou despotes dont les états se nomment Chittrauj, Mastouch, Drousch, etc., etc. Quoi qu'en pense un savant géographe (Ritter), ce pays ne sauroit être le Kacheguer du médecin Bernier; la caravane que Bernier vit à Cachemyr venoit évidemment de plus loin, et sans contredit du véritable Caschgar dans la Petite-Boukharie. Mais le Khauschkaur des relations modernes pourroit bien être le Kakares ou Kokares de Thevenot et d'autres anciens voyageurs. Ce nom, d'après le père Georgi, signifie Têtes-Blanches, et indique ainsi une race différente des Hindous. Les limites du Kakares, au nord, ont toujours paru très-incertaines aux meilleurs géographes. (D'Anville nomme ce pays Kakaner.)

In the quoted passage MALTE-BRUN follows the stretching of the Himalaya, and proves that this system is at the southern margin of the great plateau. He does not believe in native reports about great desolate plains to the north of Himalaya, and was more perspicacious in this respect than British scholars many years later. Further, he suspects the existence of a second range north of the Himalaya, which in later years has proved to be the Transhimalaya or the S. E. continuation of the southern Kara-korum. This second range he supposes to be the same as the Kentaïsse or Kailas, which is also perfectly correct. It is situated north of the Manasarovar

as MOORCROFT had shown, and separates Little Tibet from the unknown parts of Great Tibet. He surprises us by saying that the N. W. continuation of this range is the Mus-tagh. Quoting ELPHINSTONE, he even places the Kara-korum as a joining link between the Kentaïsse (= Transhimalaya) and Mus-tagh. To the N. E. of the latter range are the extensive plains of Little Bokhary. Malte-Brun admits, however, that regarding the Kara-korum, only very scanty information existed. The Kara-korum he suggests may be the same as SHEREFEDDIN'S Karangu-tagh. He mentions a passage through the Mus-tagh and the plain of Pamir to Yarkand and Kashgar. Malte-Brun also tries to locate the Belor from Elphinstone's map and MARCO POLO'S narrative. On the other hand it is curious that he could suppose that the Pamir was situated between Hindu-kush and Mus-tagh, all three forming a triangle. With the source branches of the Indus he is perfectly familiar. Finally, it is interesting to see how well he makes use of the writings of BERNIER, DESIDERI, GEORGI, and RITTER.

In another essay MALTE-BRUN gives a summary of what was known in the regions of the western Kara-korum, though the result at which he arrives here shows that he feels rather uncertain of the correctness of the orographical deductions at which he has arrived in the passages quoted above.¹ He goes so far as to ask whether there really exists a country named Tibet, Tanbout, Boutan or Bouddhistan. Or does this name only signify the title of the ecclesiastical state of the Dalai Lama? Is the name Little Bokhary known at Yarkand, and is the appellation Little Tibet known at Ladak? Did ever a country called Tangoot exist? As to the physical geography he continues:

La géographie-physique élève encore des questions plus nombreuses et plus importantes. Si les monts Himalaya, qui forment la terrasse méridionale du Tibet, atteignent une hauteur de 25 à 26,000 pieds, la chaîne de Mous-Tag, qui couronne ce plateau tibétain, devrait donc s'élever à plus de 30,000 et davantage. Cela, sans doute, n'a rien d'impossible; mais le climat de la Petite-Boucharie, quoique au nord de la chaîne du Mous-Tag, doit avoir assez de douceur pour favoriser la culture du raisin et celle du coton. Quel abaissement de niveau cette circonstance n'exige-t-elle pas? Y auroit-il donc au centre du prétendu plateau d'Asie un immense enfoncement, semblable au bassin d'une mer Caspienne disparue? Ou bien, toutes ces chaînes de Belour-Tag, de Mous-Tag, de Musart, seroient-elles aussi incertaines que les monts Kemri et les monts Lupata de l'Afrique? N'y auroit-il d'autres montagnes que celle de l'Himalaya au sud et celles de Bogdo, du Grand et du Petit-Altaï au nord? Ces montagnes elles-mêmes seroient-elles moins des chaînes à deux revers que de simples terrasses ou montées, terminées par un plateau? En revenant ainsi à l'ancienne hypothèse d'un immense plateau, interrompu seulement par des collines, on ignore toujours la juste étendue des redoutables déserts de Cobi et de Chamo Les noms même qu'on donne à quelques-unes des montagnes de l'Asie centrale font naître des soupçons. Il y

¹ *Coup d'oeil sur les découvertes géographiques qui restent à faire Nouvelles Annales des voyages.* Tome I. Paris 1819, p. 1 et seq.

a une chaîne, nommée Moussart, que Pallas place au milieu du désert au nord-est du Tibet, et Islenieff dans le nord-ouest de Kaschgar; mais Sart étant synonyme de Tag, les monts Mus-Sart de Pallas pourroient bien être les mêmes que les monts Mous-Tag.

His conclusion that the mountains north of Himalaya ought to have a height of 30,000 feet is easy to understand.¹ Little Bokhary he regards as being situated north of the Mus-tag, and it seems as if he meant what we call the Kwen-lun. He doubts that the supposed plateau of Asia can be very extensive, and suggests the existence of a depression which would be like the basin of another Caspian Sea. Malte-Brun does not feel quite sure of the existence of the ranges; Belur, Mus-tag and Musart, the two last names perhaps signifying one and the same range. If there is really a great plateau, where are the boundaries of the Gobi and Shamo deserts? In spite of this learned geographer's deep perspicacity in many details, the distinctly formulated questions he puts prove the great want of authentic knowledge regarding these regions.

When Malte-Brun asks whether a country, Tibet, exists or whether this name has only a religious signification, he could have obtained information directly or indirectly from Chinese sources. A short notice was published the same year, 1819, in *Lettres édifiantes*, ed. Lyon, which, though referring to an earlier date, had something to say of the boundaries of Tibet.² It is true, however, that a student of geography at that time must have felt rather bewildered when he heard that Tibet bordered upon the great sand desert in the west:

Tsang est le nom ordinaire que les Chinois donnent au Thibet. Ils l'appellent aussi Sy-Tsang, parce que Sy veut dire occident, et qu'en effet le Thibet est l'occident de la Chine, au delà des provinces du Yunnan et du See-Tchouen. Anciennement il était connu sous le nom de Jong ou de Kiang, ou de Sy-fan. Il a encore celui de Parountala, ou Barantolo, et celui de Tangout.

L'étendu de ce pays, d'orient en occident, est de 6400 lis (650 lieues), 200 lis faisant un degré de latitude, ou 20 lieues marines. A l'orient, le Thibet va jusqu'aux frontières de See-Tchouen

Au sud-est, le Thibet touche les frontières du Yunnan. A l'ouest, il s'étend jusqu'à Ta-cha-Hai, c'est-à-dire jusqu'au pays sablonneux ou la mer de sable; car c'est ce que désignent ces trois mots chinois. Au nord, il va jusqu'aux frontières du Tsing-Hay, ou du pays de Coconor.

Only one year later, or in 1820, HUGH MURRAY published his work on discoveries and travels in Asia, in which he, at some places, speaks of our regions.

¹ In an article: *Hauteur des montagnes d'Himalaya*, we read: Pourquoi ne découvrirait-on pas un jour, au nord de l'Himalaya entre cette chaîne et celle du Zungling ou entre la chaîne du Zungling et celle de Thianschan ou Montagnes célestes, des sommets qui seroient supérieurs au Dhawalagiri comme celui-ci l'est au Chimborazo, et le Chimborazo au Mont-Blanc? *Nouv. Annales des voyages*. Tome XXVI. Paris 1825, p. 266.

² *Mémoire sur le Thibet et sur le royaume des Eleuthes, nouvellement subjugué par l'empereur de la Chine; avec une relation de cette conquête. Lettres édifiantes*. Lyon 1819, Tome XIII, p. 226.

In connection with Alexander's march towards India, he speaks of the western continuation of the Himalaya: »The troops, in their way, encountered that mighty range of mountains, prolonged from the Himmaleh, which was known to the ancients under the names of Caucasus or Parapomismus.»¹ Speaking of the work of the Chinese Lamas, Murray discusses the previous view regarding the sources of the great rivers, and complains of the meagre knowledge of Central Asia in general. He says²:

The Brahmapoutra, indeed, was derived not very erroneously, from the eastern side of the lake Mansarowar; but the two rivers which took their rise on the other side, and one of which passed by Ladak, were represented most erroneously as the head of the Ganges. This delineation was adapted in all the European maps; while the Indus, identified with the Kama, was derived from the Belour mountains, and made to run almost directly south through its early course The interior of Thibet, and of the vast regions between Cashgar and China, containing probably many great countries and cities, are still known only by the vague reports of the early travellers; nor is there any present appearance of our knowledge in this quarter being very speedily extended.

Dealing with the relations between the Himalaya, Hindu-kush, Mus-tagh, and Tibet, Hugh Murray arrives at very interesting results, which in some particulars have a great resemblance to the view of MALTE-BRUN.³

From its central point near the source of the Ganges, the chain proceeds in a north-westerly direction till it reaches the frontier of Cashemire. It then takes a direction due west, which, amid various windings, it follows pretty constantly for about nine degrees of longitude, till it reaches a lofty peak near Caubul, called Hindoo Coosh; which name is pretty generally applied to all this part of the chain. It is also in our maps called Indian Caucasus, a name for which there seems little place, being derived solely from the ancient error above noticed. Hindoo Coosh yields little in magnitude to Himmaleh, and has its summits equally clothed in everlasting snow

The liminary mountain ridge of India declines in the north into the high table-land of Thibet; but immediately after it swells into another enormous chain, which, though it presents a less sensible rise from its lofty base, has been supposed even to exceed its neighbour in absolute elevation. To this the maps give the Turkish name of Mooz Taugh, though I was assured by Dr. Hamilton that in India it is universally considered as only another branch of Himmaleh. I conceive it to be the Imaus conversus ad Arctos of Ptolemy, who particularly describes the peril and difficulty with which it was crossed by the Seric caravans. Precisely at the point indicated by him, a branch of it, under the name of Mount Caillas, runs southwards, and locks in near Lake Mansarowara with the Indian Himmaleh. What may be its progress to the east and north-east seems quite unknown, though some great mountain structure seems there necessary to give rise to the mighty streams which water China and India beyond the Ganges.

In these words he, therefore, speaks of an enormous range north of the Himalaya, and correctly says it is inferior in height to Himalaya, whereas Malte-Brun had supposed it could easily be higher. This northern range is not, as might have

¹ *Historical Account of Discoveries and Travels in Asia, etc.* Vol. I. Edinburgh 1820, p. 10.

² *Op. cit.*, p. 516.

³ *Op. cit.*, Vol. II, p. 441.



The Map of Central Asia in Murray's work, 1820.

been expected, the Transhimalaya, but the Mus-tagh, a branch of the Himalaya and identical with the meridional Imaus of PTOLEMY. The Kailas is regarded as a branch of the Mus-tagh, which, to a certain degree, may indeed be said to be the case.

The great French scholar, ABEL-RÉMUSAT correctly identifies the Kara-korum with the Mus-tagh. In a review of HUGH MURRAY'S book he says:¹

On voit encore Karakoroum placé à deux endroits, suivant Danville et suivant Ficher, quoiqu'il n'y ait plus a présent le moindre doute sur les causes qui avaient induit en erreur le savant géographe français, et ce même nom de Kara-Koroum donné comme synonyme de Mous-tagh à la chaîne de montagnes qui sépare le petit Tibet du pays de Yerkiyang et de Khotan.

RÉMUSAT also discusses the map of MURRAY accompanying his work (Pl. XXV).² This map is of great interest as illustrating the orographical conception of Murray. The enormous range of mountains known of old is called, to the north of Herat, Paropamisan Mountains, to the north of Kabul Hindoo Coosh, to the north of Attock Indian Caucasus, and thence to the S. E. Himaleh or Himachal Mounts. North of the eastern part of this range is Tibet, and north of its western part Cashgar and Little Tibet. In the latter country is a nameless range running N. W.—S. E. which is pierced by the joint Indus. This river is formed by two branches, one coming from the N. W., the other from S. E. from the neighbourhood of Ewan-Hrad Lake. Where the two branches join is Leh or Luddack. On the uppermost Indus is Gortope to the east of Cailas Mts., which is a range in connection both with Himaleh and the nameless range. Parallel with and N. E. of the latter is Mus Tag or Kara Korum Mountains, the western part of which forms the southern boundary of Little Bukaria, whilst the eastern enters Tibet in a S. E. direction. A second branch from the Kara Korum stretches to the east, south of Lop-nor and is called Musart of Pallas, which is obviously a misunderstanding of Pallas' meaning. The western margin of Eastern Turkestan is composed of a meridional range without a name. To the west of it is a range called Pamer Mountains. Murray's map gives an excellent idea of the standpoint of European knowledge regarding the Kara-korum in the year 1820.

In connection with the Chinese geography described in Vol. VIII, I mention ABEL-RÉMUSAT'S opinion regarding the Ts'ung-ling Mountains. In the present historical account his orography in the Kara-korum regions should not be missing, even with the risk that the same passage may, in one or two cases, be quoted twice.

To the period dealt with in this chapter, also belong the journeys of the GERARD brothers. They had, however, no occasion to study the Kara-korum System.

J. G. GERARD, one of the martyrs of exploration, who died on Sir ALEX. BURNES' expedition to Bokhara, speaks of the dreadful symptoms felt in crossing the mountains:

¹ *Nouveaux mélanges asiatiques*. Par M. Abel-Rémusat. Tome premier. Paris 1829, p. 424.

² *Hindoostan*. Published April 10th 1820 by A. Constable & Co., Edinburgh.

»Between Ladak and Yarkund, I have been told by an intelligent servant of Mr. Moorcroft's of fatal consequences from the want of due precaution. He says that the passages of the lofty range should be made while fasting, and recommends frequent doses of emetic tartar during the journey. He relates an instance of a wealthy Russian merchant who was on his way to Leh, of Ladak, to see Mr. Moorcroft, having perished in crossing one of the passes because he made a hearty meal before starting.»¹

Then he gives a discussion on the physiological effects of the reduced atmospheric pressure, which may be said to be classic.

Nor had Capt. ALEXANDER GERARD on his brilliant journey in 1821, an opportunity to get any information on the Kara-korum. He only indirectly touches upon the mountains when speaking of Ladak: »The country is very mountainous, and occupies a great extent on both banks of the Sing-Zhing-Khampa, or Indus river: it is bounded on the North by Yarkund, and its dependencies; on the East and South East by Chinese Tartary.... The hills are of a crumbling gravelly nature, and seldom shoot into peaks; and by the description of travellers, I conclude they are composed of limestone. The whole tract is arid and almost without foliage....»²

Like most other travellers and geographers of his time he extends the southern limits of Chinese Tartary, *i. e.* Eastern Turkestan so far south as to place it S. E. of Ladak. This may be explained from D'ANVILLE'S map and the general ignorance of the eastern stretching of the Kwen-lun System.

¹ George Lloyd: *Narrative of a Journey from Caunpoor etc.* Vol. I. London 1840, p. 323.

² George Lloyd: *Narrative of a Journey from Caunpoor etc.* Vol. II, *Capt. Alexander Gerard's Narrative.* London 1840, p. 260.

CHAPTER XVII.

RÉMUSAT, FRASER, LEYDEN, AND ERSKINE.

In the preface to his famous book of Khotan, ABEL-RÉMUSAT gives us some glimpses of his views regarding the mountains S. W. of Khotan.¹ Under the name *Montagnes Bleues* he understands »la chaîne détachée de l'Himâlaya qui est au midi de Khotan». It is the Chinese Ts'ung-ling. He quotes some Chinese authors who say the name has been given on account of the abundance of onions in these mountains. Curiously enough he thinks they are wrong and that »the Blue Mountains» is a more correct translation. In our days a range is known, also belonging in the Kwen-lun, but situated farther east, which in Turki is called *Piaslik-tagh* or the Onion Mountains.

Au reste, les montagnes Bleues sont célèbres depuis longtemps dans la géographie de la Tartarie, comme le point culminant d'où les eaux vont, à gauche se jeter dans la mer d'occident, et à droite se perdre dans les sables du Cha-mou. Suivant l'I-toung-tchi, ces montagnes sont au S. O. de Yerkiyang; le Commentaire sur le livre des eaux leur donne mille li de hauteur, ce qui, du moins, indique des montagnes du premier ordre Suivant les modernes, elles sont au S. O. de Yerkiyang, et se dirigent du S. O. au N. E., en s'inclinant un peu vers l'orient, ou elles se lient aux montagnes du Ciel, c'est-à-dire à la chaîne de Kamoul. On remarque que les monts Thsoun-ling, dont il est parlé dans le temps de la dynastie des Han, sont ces montagnes à l'ouest de Tourfan, d'où sortent un grand nombre de rivières, et que la montagne située au midi de Iuthian est dans le pays de Yerkiyang, d'où sort le Ta-li-mou. Dans les temps postérieurs on a pris, l'une pour l'autre, ces deux chaînes des monts Thsoun-ling et de la montagne méridionale.

Under the Sung (961 A. D.)² it is said that the kingdom of Khotan had the mountains of Ts'ung-ling to its south and was limitrophe to the country of the Brahmans; to the east it had the Tibetans as neighbours. To the N. W. was Kashgar. East of the town was the river of the white »iu», to the west that of the green »iu» and still farther west that of the black »iu». The source of these rivers was in the range of the mountains of Kouen, which Rémusat identifies with Himalaya.

¹ *Histoire de la ville de Khotan*. Paris 1820, Préface, p. VI et seq.

² *Ibidem* p. 84.

In the chapter »Anecdotes relatives à lu-thian»¹ we find the following passage, from the time of the Tsin Dynasty: »La rivière du lu est hors de la ville royale; sa source sort des monts Kouen; elle coule à l'ouest, l'espace de 1300 li, et parvient aux frontières de ce pays, à l'endroit où est la montagne de la Tête du Boeuf.»

Quoting PÉTIS DE LA CROIX, he places the sources of Yurung-kash and Karakash in the Karangouï-tagh, »montagne ténébreuse», although they are situated south of Karangu-tagh proper, and he adds:²

»On sait que c'est le nom donné à cette chaîne qui vient de l'Himâlaya, et qui porte sur les cartes de Danville le nom de Belur, qui paraît avoir la même signification.»

When reading ABEL-RÉMUSAT'S *Memoir* on the relations between Christian princes and the far east,³ one must agree with him that memory has conserved the names and travels of only a very small number of those who visited the east; and that in olden times the number of those who were able to travel was much greater than that of those who were able to describe these travels. And still, after having mentioned some of the great travellers, as MARCO POLO, he adds: »Le monde sembla s'ouvrir du côté de l'Orient; la géographie fit un pas immense; l'ardeur pour les découvertes devint la forme nouvelle que revêtait l'esprit aventureux des Européens.» We know, however, how all these travellers avoided the highest regions of Asia, which, until our days, have remained the last part of the Continent to be conquered.

Again, in another paper, 1825,⁴ ABEL-RÉMUSAT makes the Kwen-lun synonymous with the Himalaya. And here the Ts'ung-ling Mountains are extended far to the north: »Un géographe chinois, parlant de la chaîne de montagnes qui s'étend au nord de Kaschgar, et qui est si célèbre à la Chine sous le nom de Monts Bleus (Thsounghing), remarque etc....» The following passage⁵ also points to the inaccessibility of the Kara-korum System: »Entre Kaschgar et le Kaschemire, dans un endroit que M. d'Anville a laissé presque entièrement vide sur sa carte, les géographes chinois ont toujours placé deux pays qu'ils désignent par les noms de grand et de petit Po-liu (Pourout). Ces pays, qui sont écartés de la route par laquelle on va ordinairement de Perse en Chine, acquièrent de l'importance quand les Tibétains commencèrent, au VIII^e siècle, à former un empire puissant dans les régions centrales de l'Asie.» And from the same Chinese sources he describes Kashmir as »entouré par une chaîne de montagnes qui le défendent des attaques des peuples voisins....»

¹ *Ibidem* p. 112.

² *Ibidem* p. 151.

³ *Mémoires sur les Relations Politiques des Princes Chrétiens . . . avec les Empereurs Mongols.* Paris 1824, p. 154 et seq.

⁴ *Mémoires sur plusieurs questions relatives à la Géographie de l'Asie Centrale*, par Abel-Rémusat. Paris 1825, p. 40 et seq.

⁵ *Ibidem* p. 98.

A German and a Frenchman, KLAPROTH and RÉMUSAT, were the first pioneers to open up new perspectives on Asiatic geography by way of using the Chinese sources. One has a feeling of standing upon solid ground when studying their translations and discussions of the Chinese geographers.¹ At a time when European explorations had not yet penetrated into the interior of High Asia, the classical Chinese information was of a still greater value and importance than in our days.

Amongst explorers of the epoch who have contributed, in a very modest degree it is true, to the knowledge of the region in question, was JAMES B. FRASER.² Speaking of the breadth of the mountainous tract that overlooks Hindustan, he says:³ »In all the routes of which we have accounts that proceed in various directions towards the Trans-Himālayan countries, hills covered with snow are occasionally mentioned as occurring, even after the great deserts are passed and the grazing country entered. The breadth, then, of this crest of snow-clad rock itself cannot fairly be estimated at less than from seventy to eighty miles.»

And further, of the general orographical morphology of the country: »The only European travellers who are known to have entered on this new ground are Messrs. Moorcroft and Hearsay, who penetrated by the Nitee-Mama pass, and reached the lake of Mantulloe, Mansrowar, or Mepāng. All these sources lead us to presume a pretty extensive detail of hills beyond the loftiest belt, that by no means terminate even at Gara or Gartope, though they do not reach the height of those to the westward and southward. A branch of the Cailas range, undoubtedly a ramification of the Himālā, stretches out beyond the lake Mansrowar, a considerable way towards Gartope. Beyond this point there seem at present to exist no grounds on which even a conjecture may be formed concerning the nature of the country.»

Fraser is aware of the fact that the mountains near Gartok are exceeded in height both by the mountains to the south and those to the west, *i. e.* the Himalaya and the Kara-korum. The Kailas is in his opinion a ramification of the Himalaya.

At another place, talking of the source of Bhagirath, Fraser returns to the question of the breadth of the »Snowy Range» and makes it increase to a hundred miles, which still would not even reach to the course of the Tsangpo:

The breadth of the mountainous region may probably occupy a space of from eighty to one hundred miles: The grounds for supposing this to be the extent of that space, are not only our own observation, but the information we have received from different and intelligent persons, relative to routes through the passes. Thus reasoning from probabilities, observation and information, Rudra Himāla is at least removed to the center

¹ v. Richthofen: *China*, I, p. 722. Comparing the two scholars Richthofen says: Obgleich an Universalität der Kenntnisse und kritischer Schärfe nachstehend, reiht sich doch Rémusat durch die hohe Gediegenheit seiner Arbeiten seinem Zeitgenossen würdig an.

² *Cp.* Vol. II, p. 40 *et seq.*

³ *Journal of a Tour through part of the Snowy Range of the Himālā Mountains and to the sources of the Rivers Jumna and Ganges.* London 1820, p. 282.

of the snowy range; and it is fair to conclude that the land, mountainous and elevated as it is, rather falls than rises to the north and north-east of this mountain. This is confirmed by the pundit, and those zemindars who have been accustomed to view the country from lofty situations on either side of the glen of the Bhagirathi. So far as the people of the place — pundit, brahmins, and zemindars — were questioned, merely about their own district and the places contiguous, their answers were distinct and prompt, with every appearance of being correct to the best of their apprehension. But when any attempt was made to carry them further abroad, or to collect anything of the topography of the country beyond this great range, they failed altogether: either at once saying they knew nothing about the matter, or giving improbable inconsistent accounts. Some of them asserted, that there was a plain and well cultivated country at no greater distance than 12 cos (horizontal distance) from the other side of Rudok Himála, but, from the nature of the country it was not possible to reach it, except by a very circuitous route. But whether they alluded to the great plains of Tartary, or to some intervening valley, it was impossible to discover. They however asserted, that it might be seen from some of the high peaks in the neighbourhood, which I must believe to be false, or at best very doubtful: as I think there cannot be any means of ascending a point high enough to afford such a view from any place near this spot.¹

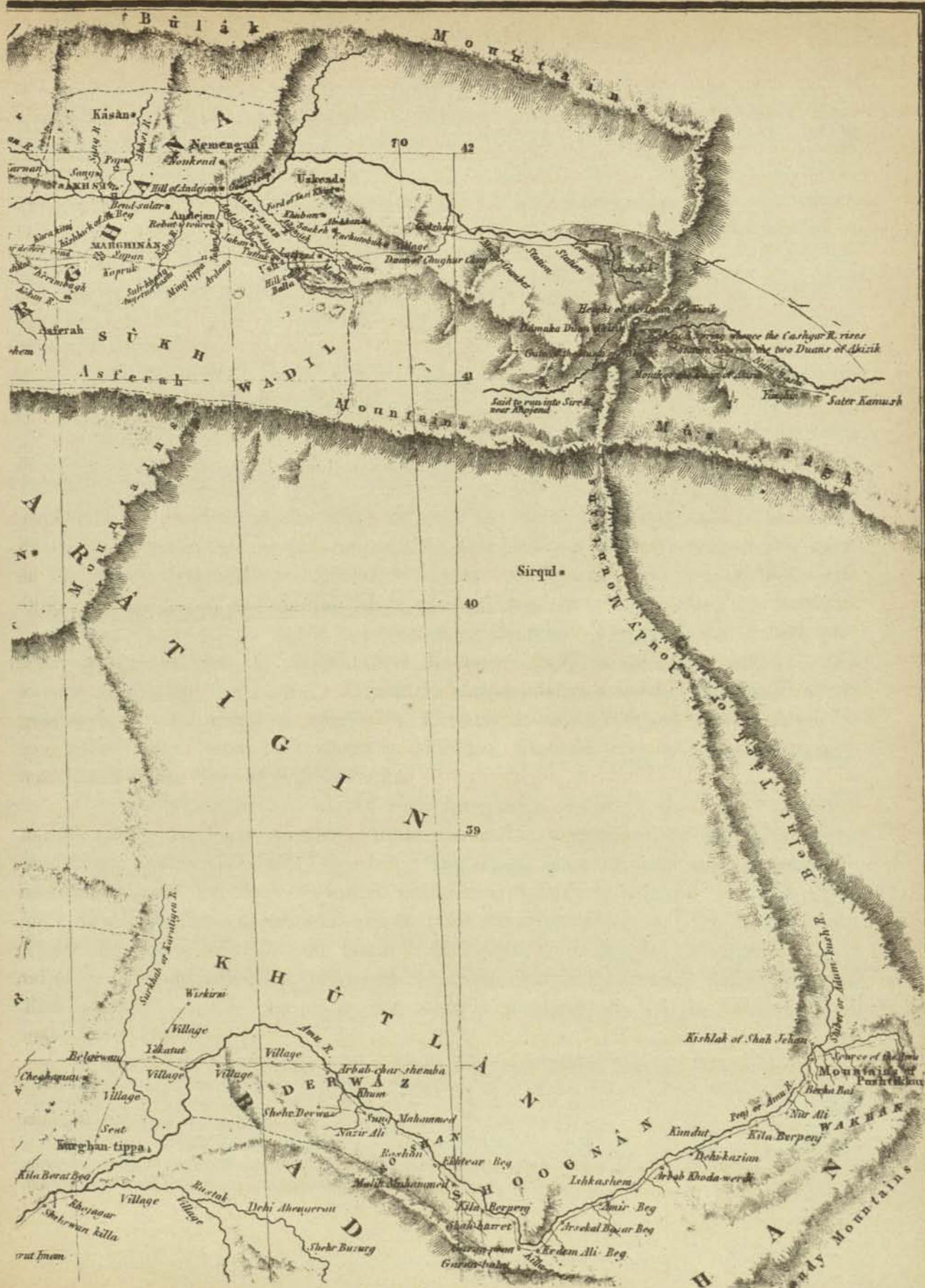
His opinion that the country falls to the north and N. E. from the Himalaya, may, if only the peaks are considered, indeed be said to be in accordance with fact. But Fraser probably believed that this fall was definite and continued the whole way to Great Tartary: In a note he adds, though the passage is not quite easy to follow:

»If such a plain do exist, it cannot well, I think, be near the great plains on the N. E. and E. of the Himálaya, as the routes we have obtained from more creditable authorities, imply the existence of a far greater extent of hills stretching even to the southward of Komaon . . . » Every explorer of these regions will agree with Fraser in his complaints regarding the difficulty of getting reliable information from the natives.

In the *Journal Asiatique* I found a short narrative of a journey of a Persian merchant, written in Moscow in 1820, and translated by Mr. WOLKOW at St. Petersburg.² It is a pity that the description of the journey, which had been undertaken several times by the merchant, is so short that no conclusions can be drawn from it. However, he passes through Aksu and Yarkand and after some preparations he starts for Tibet (Ladak). On both sides of the route are great mountains. After having crossed a river he comes to a great mountain called Caracouroun-padichah, »where in old times a town existed». »Après sept journées de marche, on vient à un endroit où les vapeurs qui s'élèvent de la terre font enfler le corps des hommes

¹ *Account of a Journey to the Sources of the Jumna and Bhagirathi Rivers.* By James B. Fraser (without a year), p. 227, 230.

² *Route depuis Sémipalatnoy jusqu'à Cachemir. Journal Asiatique.* Tome IV. Paris 1824, p. 226. *Férrussac's Bulletin de sciences géographiques, sixième section.* Tome III, Paris 1825, p. 106.



Map of the Countries of Ferghana & Bokhara, London 1826.

et des chevaux. En général l'air est très-malsain. Plus loin l'on rencontre encore à moitié chemin une grande montagne, qui est couverte de glace pendant toute l'année, car le soleil ne s'y fait jamais sentir. On y voit un lac, qu'on laisse à quinze pas de distance....» Approaching Tibet there is another mountain which can be crossed only by the help of »cotas» or yaks, and not far from Tibet there is a town, entirely situated on the slope of a mountain. The last-mentioned mountain is, of course, Chang-la, and the »town» is Tikse-gumpa. We easily recognize the Kara-korum Pass, and the ice-covered mountain may be Saser-davan, or perhaps, the Kumdan glaciers, which seems the more likely as he mentions a lake, or more probably a river.

I will finish this chapter with a *résumé* of the orography of the English edition of SULTAN BABER'S Memoirs, which in some particulars is of no small interest.¹

In the preface, p. XII and XIII, W. ERSKINE gives some hints regarding the materials of the map, which was constructed by Mr. CHARLES WADDINGTON of the Bombay Engineers: Thus some valuable manuscripts of Lt. MACARTNEY and of Captain IRVINE were used, regarding the provinces to the north and west of Hindustan. From Mr. MOORCROFT he got SYED IZZET ULLAH'S journal in Persian. The route of the latter was found to traverse great parts of the nearly unknown districts often spoken of by BABER, and crosses the Emperor's kingdom. This journal was found to be of the greatest service in the construction of the map. The result was a very nice *Map of the Countries of Ferghana & Bokhara, chiefly constructed from original Routes and other documents*. There is a note dated Bombay, December 1816, and signed by Waddington: «N. B. The Country south of Bokhara & Samarkand, is laid down, with several alterations & additions, from the map of Lieut. Macartney, corrected by the Hon. M. Elphinstone.»

To us the orography is the most interesting feature of the map (Pl. XXVI). To the north, Ferghana or the valley of Sir-daria, is bounded by the Ming Bûlâk Mountains, and to the south by a very long range carrying, from west to east, the following names: Ak Tâgh or White Mountains, Asferah Mountains, and Mûz Tâgh. From this range two meridional ranges start towards the south. The western one crosses Karâtigin, and is called Kara Tâgh or Black Mountains, the eastern one is called Belut Tâgh or Cloudy Mountains. From the Mountains of Pushtikhur, the latter sharply turns to the S. W. but without changing its name. This map is

¹ John Leyden and William Erskine: *Memoirs of Zehir-ed-Din Muhammed Baber Emperor of Hindustan etc.* London 1826. Two years before, or in 1824, KLAPROTH wrote: Le Bâbour-Nameh contient la relation des guerres de son auteur. Il existe une traduction persanne de cet ouvrage; elle se trouve à la Bibliothèque du Roi de France. Le livre est intéressant pour son contenu, et pour la langue dans laquelle il est écrit. C'est du turc djagataïen, mêlé avec une grande quantité d'expressions arabes et persannes. — *Notice du Bâbour-Nameh, ou histoire du sultan Bâbour écrite par lui-même en turc oriental.* *Journal Asiatique.* Tome IV. Paris 1824, p. 88.

important, being an attempt to use all reliable material and to approach the truth as nearly as then was possible.

In the text (p. XVIII) ERSKINE says: »The Túrki nations have the western boundary of the Moghuls as their eastern frontier; on the south they have the Múz-Tâgh, the Belût-Tâgh, the Hindû-kûsh, and the limits of the cultivated country of Khorasân down to the Caspian....»

Erskine gives the following interesting explanation to the orography of the map.¹

It has been already remarked, that the Himmâla Mountains, those of Thibet, Kashmîr, Hindûkûsh, and Paropamisus, form a broad and lofty barrier, separating the countries of northern from those of southern Asia. The mountains, as they advance west, acquire a very great height, and measurements made at various places, towards Nepâl and Hindûkûsh, by assigning to these ranges a height of upwards of 20.000 feet, would make them rank with the highest in the world.² Nearly parallel to this great chain, on the north, runs a considerable range, which has been called the Múz-tâgh, or Ice-Mountains. It extends on the east, at least from the northward of the Tibet range, near Leh or Ladak, and has a north-westerly direction, skirting Eastern or Chinese Turkistân on the south till it meets the Belûr, or Belût-tâgh Mountains in the latitude of about 40° 45', and longitude 71°; whence it seems to proceed on westward, as far as Khojend and Uratippa, under the name of the Asfera Mountains, and then divides into three or four principal branches.... Connecting these two great ranges of Kashmîr or Hindukûsh, and of Muz-tagh, a third range proceeds northwards from that part of the Hindukûsh which lies near Kafferistân, in longitude 72°, and meets the Múz-tâgh, as already mentioned. This range is called by geographers the Belûr, or Belût-tagh. It seems to revive again to the north of the Múz-tâgh, running, under the name of the Ala- or Alâk-tagh, and according to others of the Ming Bulâk, or Arjun Hills, first to the north as far as north latitude 42°, and next to the westward towards Tashkend, where it terminates in the desert of Arâl, about the 65th. or 66th. degree of east longitude. The extensive country which lies between the grand ranges of mountains, the Kashmirian, Múz-tâgh, and Belût-tâgh, does not perfectly belong to Turkestân, though some parts of it at the present day are traversed by Túrki tribes.

He continues his detailed description thus:

»The mountains by which this country is buttressed on every side are very lofty, and bear snow on their summits the greater part of the year. It has been conjectured, that if we except some parts of the Greater Tibet, it is the highest table-land in Asia.» Thus still a hundred years ago, this complicated world of mountains was regarded as a table-land, a belief that held its ground for another fifty years. Erskine finds a confirmation of the enormous height of this table-land, which he calls Upper Kâshgar, in the fact that great rivers, as the Indus, the Amu-daria and the Lop-nor rivers start from there in different directions and to different seas or lakes. On the other hand: »No river is known to cross the Muz-tagh; but the rivers which originate

¹ Preface, p. XXVI.

² To this Erskine has a note stating that according to recent measurements the Himalaya Mts. reached an altitude of 28.000 feet, »which would make them decidedly the loftiest in our globe».

on its northern face, proceed down to the desert and the lake of Lop-nor. Of these which flow north, some originate not very far from the Indus, which flows from the eastward by Ladak, between the two ranges, in the earlier part of its course.» The Amu-daria, according to him, has its sources in the snows and springs of Pûstikhar, and »pours down the western mountains of Belût-tagh».

Influenced by MACARTNEY and IRVINE he, however, admits that the elevated country of upper Kâshghar, »though plain when compared with the huge and broken hills which raise and inclose it on all sides — is crossed in various directions by numerous hills and valleys.» The Mûz-tâgh is less high than the other ranges, but is believed to rise from a more elevated base. Therefore, the whole country slopes from east to west and from north to south. The S. W. part of the table-land is called Chitrâl, the N. W. part, Pamir or the Plain, a name often attributed to the whole country. The Dards dwell in the S. E., and the rest of the table-land is occupied by Little Tibet, which on the east stretches away into Great Tibet.

As to the ramifications from the Bolor he observes: »The Belût-tagh, in its progress from Pûstikhar to Mûz-tâgh, probably throws out many branches to the west, as the whole of the country in that direction is described as mountainous in the extreme.» Another branch, situated south of Pûstikhar, and entered on the map, is the Badakshân Mountains.

It is surprising and very interesting to read SULTAN BABER'S own description of these mountains, the passes and roads of which were perfectly familiar to him, and of which he had a much clearer conception than the geographers of Europe some 350 years after his time. He begins his description of the roads of Hindukush with these words:¹ »The country of Kâbul is very strong, and of difficult access, whether to foreigners or enemies. Between Balkh, Kundez, and Badakhshân on the one side, and Kâbul on the other, is interposed the mountain of Hindû-kûsh, the passes over which are seven in number.» Then he describes these passes, and the roads over them, and speaks with deep knowledge and understanding of the climate, the difficulties caused by snow and flood, and the season in which one has to cross the mountains. Regarding the pass of Shibertu he mentions the Kafir robbers who »also issue from the mountains and narrow paths, and infest this passage». He is no stranger to the physical laws of snow accumulation in mountains, for once he speaks of a »high snowy mountain,» believed by Erskine to be the Kuh-i-Baba, »on which the snow of one year generally falls on the snow of another». And he adds: »The Hirmend, the Sind, the Doghabeh of Kundez, and the river of Balkh, all take their rise in this mountain; and it is said, that in the same day a person may drink from the streams of all these four rivers».

¹ Op. cit., p. 139, 146, 312.

The sharp eye of Emperor Baber had observed the Himalaya, the nations living in the mountains, and the country situated north of them, and he certainly knew much more of these regions than appears from his memoirs. He calls the Himalaya »the northern range of hills», and goes on saying: »Immediately on crossing the river Sind, we come upon several countries in this range of mountains, connected with Kashmir, such as Pekheli and Shemeng. Most of them, though now independent of Kashmir, were formerly included in its territories. After leaving Kashmir, these hills contain innumerable tribes and states, pergannahs and countries, and extend all the way to Bengal and the shores of the Great Ocean. About these hills are other tribes of men.» Thus he knows the immense length of the Himalayan System. And he has done his best to gather information about its inhabitants. »With all the investigation and inquiry that I could make among the natives of Hindustân, I could get no sort of description or authentic information regarding them.... The chief trade of the inhabitants of these hills is in musk-bags, the tails of the mountain-cow (yak), saffron, lead, and copper. The natives of Hind call their hills Sewalik-Parbat.... On these hills the snow never melts, and in some parts of Hindustân, such as Lahore, Sehrend, and Sambal, it is seen white on them all the year round. This range of hills takes the name of Hindû-kûsh, near Kabûl, and runs from Kabûl eastward, but inclining a little to the south. All to the south of this range is Hindustân. To the north of these hills, and of that unknown race of men whom they call Kâs, lies Tibet. A great number of rivers take their rise in these mountains, and flow through Hindustân.»¹ Baber thus extends the name »Sewalik» to the whole

¹ A. PAVET DE COURTEILLE translates this passage as follows: »Au nord se trouve une chaîne de montagnes qui se relie à celle de l'Hindu-Kouch, du Kâfiristân et de Kachemir. Au nord-ouest sont situés Kaboul, Gazna et Kandahar. Une fois qu'on a passé le Sind la terre, l'eau, les arbres, les pierres, les populations, les coutumes, les usages, tout appartient à l'Hindoustân. J'ai déjà parlé des montagnes qui s'élèvent au nord et au milieu desquelles on rencontre, au delà du Sind, des contrées qui dépendent de Kachemir. Quoique, à l'époque actuelle, la plupart de ces districts montagnards, tels que Pekli et Chehmeng, ne relèvent plus de Kachemir, ils faisaient autrefois partie de ses possessions. Au delà de Kachemir, les mêmes montagnes comprennent une foule de tribus et de districts qui se prolongent sans interruption jusqu'au Bengal ou, pour mieux dire, jusqu'au bord de l'Océan. Quelques renseignements que j'ai pris auprès des natifs de l'Hindoustân, ils n'ont pu rien m'apprendre de certain sur ces montagnards.... Les produits qu'on tire de chez eux sont le musc en bourse, les crins de boeuf marin (koutas-i-bahari), le safran, le plomb et le cuivre. Cette chaîne de montagnes porte dans l'Inde le nom de Saoualak-Parbat, c'est-à-dire les cent vingt-cinq mille montagnes, saoualak signifiant 'cent vingt-cinq mille' et parbat signifiant 'montagne'. La neige ne disparaît jamais de cette région et, de même que dans quelques autres parties de l'Hindoustân, telles que Lahor, Sirhind et Sunbul, elle s'y montre toujours éblouissante de blancheur. A Kaboul, la chaîne est appelée Hindou-kouch et se développe à l'orient de cette ville en inclinant légèrement vers le sud. Tout ce qui est au sud, par rapport à elle, dépend de l'Hindoustân. Au nord de ces montagnes et de ces peuplades inconnues qu'on désigne sous le nom de Kes se trouve le Tibet. De nombreux fleuves descendent de ces gorges et coulent à travers les plaines de l'Hindoustân.... Les Saoualak-Parbat renferment les réservoirs de toutes ces masses d'eau....» — *Mémoires de Baber*.... Traduits pour la première fois sur le texte djagatai. Tome II. Paris 1871, p. 177. — The French scholar praises in high terms the edition of LEYDEN and ERSKINE, though he also criticises them on account of their insufficient knowledge of the jagatai language.

northern range of hills, which he regards as being in connection with the Hindu-kush. And he knows that this boundary wall separates Hindustan from Tibet, and gives rise to all the great rivers of Panjab, though he is not aware of the exceptional origin of the Satlej. For he says of them, *inclusive* of the Satlej: »The sources of all these rivers are in the Sewalik mountains».

His own descent, and the wonderful adventures of his life explain Sultan Baber's knowledge of these regions. Though he does not mention the Kara-korum, he may easily have known this mountain system, as he used to inquire of the natives about the unknown parts of the regions north of India, and as the Kara-korums were in connection with those mountain regions through which he marched to India.

The quoted passages of Sultan Baber's Memoirs ought perhaps to have been inserted chronologically at their right places. I have, however, preferred to give them in connection with the preface of the editors of the English translation and with their map, which allows us to make a direct comparison between the knowledge of the great Baber and that of his commentators hundreds of years after his death.

CHAPTER XVIII.

KLAPROTH.

In previous volumes of this work I have often had occasion to mention the magnificent way in which J. KLAPROTH, the great German scholar, has contributed to Europe's knowledge of the geography of Central Asia.¹

He has formed an epoch in the history of the scientific study of everything regarding Tibet, especially by the information he brought together from Chinese sources, and there is hardly a single problem of geographical importance, to which he has not contributed in a prominent way. He was the first to prove the existence of a mountain system north of the Tsangpo. He furnished RITTER, HUMBOLDT and other geographers with reliable material, and thus created a solid frame to an understanding, both of the orography and the hydrography of High Asia. He constructed the best map of Central Asia and Tibet which had ever been made since D'ANVILLE'S days a hundred years earlier, and which did not become antiquated for some 40 or 50 years.²

¹ In Vol. I, p. 82 I quoted the edition of the *Foë Kouë Ki* published by Abel-Rémusat and J. Klaproth; p. 83 Klaproth's discussion of the old Chinese-Japanese map of Asia and India; p. 88 his translation and edition of the *Wei-tsang-t'u-chih*; p. 90 the Chinese map of Tibet translated and published in 1830; p. 92 his Memoir on the Tsangpo; p. 95, his translation and description of the Hsi-tsang; p. 110 his translation from the Great Imp. Geography regarding the Manasarovar and Kailas; Vol. II, p. 60, his views regarding Tieffenthaler's map, p. 69, his hand-drawn map of the Sacred Lake and the sources of the great rivers, 1820; p. 268, I have a comparison between Klaproth and Desideri and Beligatti; p. 278, his views regarding the Tsangpo-Brahmaputra problem; Vol. III, p. 34, his views regarding the Transhimalayan regions and several maps of Klaproth, amongst which a part of his map of 1836 is discussed; p. 88, the part he has played in relation to the geography of Central-Asia in general. In Vol. VIII, in connection with the Chinese conception of the geography he occupies a prominent place. In some of the following chapters of the present volume his name will often be mentioned as it is also met with at many other places of this work, not particularly quoted in this note.

² Speaking of the Development of sinological studies in Europe, RICHTHOFEN has the following words about KLAPROTH:

Ein Deutscher und ein Franzose, Klaproth und Abel-Rémusat, sind als die Begründer der neuen Richtung zu betrachten. Sie standen auf den Schultern der Gelehrten-schule, welche um die Zeit des Wechsels des Jahrhunderts mit Leistungen von nicht geringer Wichtigkeit hervorgetreten war. Ueber Klaproth's Gedächtnis haben sich wegen der Mängel seines Charakters in den letzten Jahren tiefe Schatten gelegt; an Umfang und Gründlichkeit des Wissens, wie an Fähigkeit zu grossartiger und

According to Klaproth the whole of Tibet is traversed by three very high mountain ranges. The one farthest south is the Himalaya, situated to the south of Rakas-tal and Manasarovar. The second range begins far in the west at the gigantic peak of Gang-dis-ri or Kailasa. Farther east it includes the sources of the Tsang-po and runs eastwards to the south of this river. »The third range is the eastern prolongation of that of the Kara korrum; it begins at the point where the latter joins with a branch of the Kailasa, coming from the south, and separates Tibet from the country occupied by the nomad hordes of the Khor or Mongols, surrounds the lakes from which the Tarkou dzangbo (Targu-tsangpo) takes its origin.» The range then runs on the southern shore of Tengri-nor, and forms, at its S. E. corner, a group of very high glaciers, which, in Tibetan are called Nian-tsian tangla gangri (Nien-chen-tang-la). »These three ranges of Tibet are joined with one another by several smaller intermediate ranges, which, however, are very high, and of which several also possess glaciers at different points.»¹

KLAPROTH thus points out that there is a continuous mountain system north of the Tsangpo, and not, as D'ANVILLE had represented it on his map, detached mountains without orographical order. He boldly says that this mountain system is the eastern prolongation of the Kara-korum, which is a proof of remarkable perspicacity. The view of this range being a boundary between Tibet and the nomadic tribes of the Khor to the north, which was very nearly correct, was afterwards accepted by RITTER and HUMBOLDT, and from them by BRIAN HODGSON.² We

schneller Combination, hat er aber unter den Sinologen kaum einen Ebenbürtigen gehabt, und seine zahllosen kleineren Aufsätze sind, ebenso wie seine grösseren zusammenfassenden Werke, noch heute, trotz mancher veränderter Anschauungen, unter den wichtigsten Quellen für die Forschungen über die Geographie und Geschichte von China und Central-Asien Das gesammte, seit d'Anville angehäuften und auf chinesischen Karten in grossem Maassstab niedergelegte Material in die Gestalt einer europäischen Karte umzuarbeiten, war Klaproth's Aufgabe. Wenn schon der Fleiss und die Genauigkeit zu rühmen sind, womit er sich derselben entledigte, so war auch kaum ein anderer so geeignet wie er, die mongolischen und türkischen Namen in richtiger Weise umzuschreiben. Die Karte hat die Darstellung von Central-Asien bis in die neueste Zeit allein beherrscht, und erst seit wenigen Jahren beginnt ihre Berichtigung und Vervollständigung in einzelnen Theilen und schreitet mit wachsender Geschwindigkeit, durch die bewundernswürdige Thätigkeit der Engländer und Russen, fort. — *China*, I, p. 722. Sir HENRY H. HOWORTH says of Klaproth: »Klaproth, probably the greatest ethnographer the world has seen, and who did more for Asiatic history than nearly all other students put together, complained that he had no materials for elucidating the history of the tribes of Southern China.» — *Journal of the Anthropological Institute of Great Britain and Ireland*. Vol. IX, London 1880, p. 54. G. V. CALLEGARI speaking of Klaproth, reminds us of Ritter's words regarding Gulovkin's embassy, of which Klaproth was a member: »Der völligen diplomatischen Verunglückung dieser Embassade ungeachtet, hat doch vielleicht keine andere der Erdkunde Zentralasiens grössere Fortschritte gebracht, da sie die ganze Kraft des ausgezeichneten Linguisten Zentral-, Ost- und Nordasiens in ihr Interesse zog, dessen rastlose Thätigkeit dieser asiatischen Länderkunde seitdem eine ungemein bereicherte, kritische Gestalt zu geben vermochte.» — *Il Grande attopiano dell' Asia Centrale*. Feltre, 1911. p. 47.

¹ *Tableau des plus hautes montagnes de la Chine d'après les ouvrages géographiques des Chinois*. — *Magasin Asiatique*, Tome II, No. III, Paris 126, p. 133. — *Cp.* Vol. III, p. 36.

² Of the Khor or Chor (Hor) tribes in northern Tibet, Klaproth says at another place: Die im nördlichen Tibet und Tangut nomadisierenden Mongolen, und überhaupt alle Stämme dieses Volkes

have found how the latter disfigured and distorted the excellent attempt of Klaproth to represent the mountains north of the Tsangpo.¹

Neither Klaproth himself nor anybody else before his time had ever been so near the correct solution of the problem of the eastern continuation of the Kara-korum, as the erudite German scholar in the passage quoted above. For he directly says: »La troisième chaîne est la prolongation orientale de celle de Kara korrum.» We do not need anything more from the store of knowledge possessed by Klaproth. Nearly a hundred years ago he was clear-sighted enough to be able to follow the eastern Kara-korum to regions east of Tengri-nor. On quite recent English maps »The Eastern Kara-koram» is situated inside the British-Tibetan frontier!

Before entering upon a discussion of Klaproth's famous map, I will quote here only two or three passages which are in themselves of no importance and are only mentioned for completeness' sake. Three years before the above quoted passage, he determined the geographical position of Tibet in the following terms:

Tübet ist der grosse Landstrich welcher nördlich vom Himalaya Gebirge um den oberen Indus anfängt, das ganze hohe Tal des Zang-bu oder Buramputra nebst den Thälern seiner Nebenflüsse einnimmt, und sich östlich bis zur Gränze von China erstreckt.

In connection with religious and mythological questions he lightly touches upon the orographical questions in the following words:

Die ältesten historischen Überlieferungen der Chinesen zeigen deutlich, dass ihr Reich seinen Ursprung im nördlichen China genommen hat; und dass seine jetzigen Bewohner, oder das chinesische Volk, aus westlicheren Gegenden dort hingekommen sind. So wie die Hindu, nach Süden von den hohen Gebirgen, welche ihr Land in Norden begränzen, herabstiegen, und deshalb den Sitz der Götter und Heroen auf den nördlichen Fabel-Berg Meru setzen, so ist der Schauplatz der Chinesischen Mythologie auf dem hohen Schneegebirge Kuen-lun, jetzt Kulkun genannt, welches westlich vom nördlichen China beim See Chuchu-noor anfängt, und durch den Zung-ling mit dem Himmels-Gebirge verbunden wird.²

welche zwischen Tübet und den Städten der kleinen Bucharei hausen, nennen sich selbst Siraïgol oder Scharaïgol, und heissen bei den Tübetern Chor, *Asia Polyglotta*, Paris 1823, p. 269.

¹ Vol. III, Pl. XV.

² *Asia Polyglotta*, Paris 1823, p. 343, 356. At another place, *Tableaux Historiques de l'Asie, etc.* avec un Atlas in folio, Paris 1826, p. 29, Klaproth returns to the same question as follows: Les nouveaux habitants vinrent du nord-ouest, à en juger par le lieu où les Chinois placent le premier théâtre de leur mythologie. C'est sur la haute chaîne de montagnes couvertes de neiges appelées jadis Kuen lun, maintenant Koulkoun; elle se trouve à l'occident de la Chine septentrionale, commence au lac Khoukhou noor, et se joint par le Thsoug ling à la montagne céleste. Semblables en cela aux Chinois, les Hindous, c'est-à-dire tous les peuples, parlant des langues dérivées du sanskrit, descendus de l'Himalaya pour envahir l'Hindoustan, ont placé la demeure de leurs dieux sur la montagne d'où ils sont issus, et ont conservé ainsi dans leur religion une preuve irrécusable de leur première patrie... Les colonies arrivées du Kuen lun soumirent et exterminèrent successivement les tribus barbares.»

Here he sketches, in a few words, the ring of mountains surrounding Eastern Turkestan, and regards the Ts'ung-ling as a link connecting the Kwen-lun with the Tian-shan.¹

Of the basin surrounded by these mountains he says: L'Asie centrale, entourée des hautes chaînes des Monts célestes, du Thsoung ling, et du Kuen lun, comprend la Scythie au-delà de l'Imaüs, et le Sériqne des géographes anciens...²

In Klaproth's Atlas, accompanying, or being the principal part of, his *Tableaux historiques*, there are 27 maps of Asia, all from different times. On these maps of purely historical character the mountains, of course, play a subordinate part. It is, however, of interest to see what names he gives them. On map nr. 1 Montagne Emodus stands for Himalaya. On map nr. 2 we read M. Emodus ou Imaus. On map nr. 3 showing the political state of things at the time of Alexander the Great, he has Montagne Imaus ou Emodus (Himalaya), and in the north, M. Kuen-lun. On map nr. 6 he has, in the south, M. Imaus ou Emodus, and in the north Mt. O neou ta, which is the same as Kuen-lun. On map nr. 13 we notice O neou ta and Helling or Eastern Himalaya. The map nr. 16 represents O neou ta as the western and Kuen-lun the eastern half of the same system. On map nr. 24 only Kuen-lun and Himalaya are entered, and there is no Kara-korum at all.

In the following passage, Klaproth points out the intimate relationship between the orographical and hydrographical system of Tibet:

La chaîne de l'Himalaya, qui ainsi qu'on le sait positivement, s'étend jusque dans le Yunnan, et les autres chaînes de montagnes, couvertes de neiges perpétuelles, dont le Tibet est hérissé, forcent les grandes rivières de suivre les vallées resserrées qui les sillonnent et les empêchent, par l'énormité de leurs masses, de se frayer d'autres lits. D'ailleurs, nous observons la même chose dans le cours de rivières du Tibet oriental qui entrent en Chine, pour se réunir au Kiang et au fleuve Jaune; les vallées qu'elles traversent ne sont séparées l'une de l'autre que par des chaînes de montagnes comparativement étroites, mais, en revanche, excessivement hautes.³

A few years later he gives the following definition of the Kwen-lun Mountains:

Les Chinois donnent le nom de Kuen-lun, à la haute chaîne des montagnes qui commence au nord-ouest de leur pays et à l'occident de la province de Kan-su, s'étend droit à l'ouest, forme la frontière septentrionale du Tibet, et sépare ce pays de la petite Boukarie. Cette chaîne s'appelle chez les tribus mongoles du voisinage Khoulkhoun. Le nom chinois Kuen lun est principalement donné à sa partie orientale, qui paraît aussi être la plus haute, et couronnée de pics élevés couverts de neiges perpétuelles. Les derniers sont principalement situés dans la grande courbe qui décrit le Houang ho, avant sa première entrée en Chine.⁴

¹ Cf. *Tableaux historiques*, p. 181.

² *Ibidem*.

³ *Nouv. Annales des voyages*. Deuxième série. Tome VII. Paris 1828, p. 281.

⁴ *Nouveau Journal Asiatique*. Tome XII, Paris 1833, p. 232.

I will now direct the reader's attention to Pl. XXVII, which is a reproduction of a large part of Klaproth's famous map of 1836, including the western parts of the Tibetan highlands and, more especially, the regions of the Kara-korum.¹

Beginning in the west, amongst the mountains belonging to the Pamir, we find the meridional range Montagnes neigeuses de Bolor ou Bolor tagh, from which a few latitudinal ramifications are stretching eastwards, one of them being the Tchitchak lagh dawan. Outside the margin of the reproduction we find M. Doukhar, Keбенak dawan and M. Khan terek. South of the upper Yarkiang Osteng (Yarkand-darya) the Bolor tagh turns eastwards and forms the southern boundary of the Province of Yarkiang. In its western part it has no other legend except Montagnes neigeuses. Farther east it has some local names, as Ingghe tsipan tagh, Youl arik tagh and Défilé Kara koroum.

Here we must stop for a while and examine the road of the Kara-korum Pass. Klaproth is certainly the first who has made an attempt of representing this road in all its details, and considering the scanty material at his disposal, he may indeed be said to have been successful. He has Leh ou Ladagh ou Ville de Tübet a little to the north of the Riviere Singhe tchou, Singdzing Khampa ou Indus. From Le he carries the road over Sebou and Digher to Ahkâm on the Chayouk. The next names on the road are Daktcho-udinga, Tchamtchar and Tchouk djangal, which is the first point easy to recognize. Then follow Tchong oulang and Keftér khaneh, the latter, »House of pigeons», quite correctly written. Doung ba ilak may be Dung-balik. Mandalik and Yartobi (Yar-teppe?) are the next before reaching Kotak lak, the well-known Kōteklik. At Tchoung tach or Chong-tash, »The big stone», the river is called Khamdan R., which, of course, is the well-known Kumdan. There is also a station on the road called Khamdan, which may be supposed to be at the place where the Kumdan glaciers are passed. To the W. N. W. of the latter, and W. S. W. of the Kara-korum Pass, he has Source du Chayouk. Yaptchân is the last station south of the pass.

From the Kara-korum Pass to Kargalik, the road entered on the map of Klaproth takes the direction of the pass of Yangi-dawan in the Raskam Range, situated to the west of the ordinary Sanju-dawan road. The latter is not entered, but there is a range, N. E. of the Kara-korum Range, and called M. Kiliang tak and M. Sanadjou tak. Farther N. W. in the last-mentioned range we recognize Yanghi dawan and M. Tcheragh saldi. On Klaproth's map we find the following names on the road from the Kara-korum to Kargalik: Sarago, Ak tak, Khafaloun, Taghtek,

¹ The map is in 4 coloured sheets of different size and the scale is 1:2 600 000. The title runs thus: *Carte de L'Asie Centrale dressée d'après les Cartes levées par ordre de l'Empereur Khian Loung par les Missionnaires de Peking, et d'après un grand nombre de notions extraites et traduites de livres chinois par M. Jules Klaproth.* Paris 1836.



Aigher Sâldi, Djenghel Kirghiz, Bâgh Hadji Mohammed, Yartouli, Koulan, Terek lak pâyin, Mizâr, Tcha Kilak, Khelas ten, Ak mesdjid, Ortang, Koksâr, Langer, Tou Kayi and Karghalik. The Tisnab, or as he has it, Tisab ou Tingsa ab Otseng is drawn as coming from the Kara-korum Pass, and is called R. de Yarkand in its upper course. Klaproth's Sarago is our Sarik-ot darvasa, »The gate of the Yellow Grass«, or Sary-ut-darvasa, as HASSENSTEIN has it on his map of my journey of 1893—97.¹ Ak-tagh is a mountain on the right side of the Raskam-darya or Upper Yarkand-darya. Khafaloun is Kufelong on the same river. Djenghel Kirghiz is Kirghiz-jangal lower down on the same river. Koulan is Kulan-öldi. Ak-mesdjid is well known as being situated on the road north of Chirak-saldi and Yangi-davan. Kok sar is probably Kokyar. Langer is difficult to place as there are many Langar, as, for instance, Lok-, Akin-, and Kosh-langar S. E. of Karghalik. Tou kayi or Tokayi means »Little Forest«, and may be said of any grove of trees or bushes.

The road of which Klaproth has such excellent information is, therefore, very easy to follow on the map of Hassenstein quoted above. The greatest mistake consists in his joining the Upper Raskam-darya and the Tisnab-darya to one river.

The eastern continuation of the Sanadjou tak or Sanju-tag is called Mir dai tak and M. Ghiandjou tak, which comes to an end just south of Khara Khach. The eastern continuation of the range with the Défilé Kara koroum is the M. Kharanggoui tak, M. Haring hou tagh, M. Echime tis tak, after which the range has no more names for a long way. South of the last-mentioned is the well-known M. Keria dabahn, which is situated to the S. W. of Keria. To the S. E. of the same town is lake Yechil Koul, and south of the lake, the famous road diagonally through Tibet to Lhasa, discussed by Dutreuil de Rhins.

On Klaproth's map there are some irregular and rather insignificant mountain ranges in the desert areas of Eastern Turkestan. There is one such range from Yarkand-darya to Khotan-darya, which, at least partly, may be said to exist in reality, *viz.* the Masar-tagh. Another range runs along the Keria-darya. At the eastern edge of the map he has the legend: En allant d'ici à l'orient on ne trouve que des sables qui s'étendent jusqu'aux pays extérieurs de la frontière de Ngan si tcheou.

Returning to the western edge of the map, we find south of the Bolor tagh range and its continuation, a very mighty range carrying the classic Chinese name: *Monts Thsoung ling*. It joins the first-mentioned range in Défilé Kara koroum. From this point and westwards, it may be said to be identical with the real High Kara-korum, for this part of the system is, on Klaproth's map, called *Montagnes de glaciers*, and south of it is *Balti ou Le Petit ou Premier Tubet*. And here the Indus runs to the W. N. W. and west.

¹ *Petermanns Mittheilungen*, Ergänzungsband XXVIII. Gotha 1900.

Klaproth seems to have had the opinion that the name of Ts'ung-ling signified the High Kara-korum. On the other hand he knew, from Chinese sources, that the mountains south of Khotan were called Ts'ung-ling. He may, therefore, have been misled by this name in joining the High Kara-korum and the Kwen-lun south of Khotan in one single system, instead of making two parallel systems. In this particular point his map does not quite agree with his text of 1826, quoted above. Though, with some good will, we may admit that from the Défilé Kara koroum a mighty range stretches south and S. E. along the Upper Indus to the vicinity of Mt. Kailas, and this range may also be said to be a continuation of the Montagnes de glaciers of the Ts'ung-ling, though it comes in contact with the northern range at the Kara-korum Pass.

The range stretching S. W.—N. E. through western Tibet and called Montagnes neigeuses Ghangri ou Moussoun, KLAPROTH seems to have taken from D'ANVILLE where this range has nearly the same form, and where we meet the name Kenkri mouson. D'Anville's Dsarin Nor, which is at the western side of the range, is placed by Klaproth on its eastern side and called Dzerin noor. This may be the Panggong-tso, as Roudhough ou Routhough is situated south of it.

Klaproth has made use of a large amount of material which was unknown to d'Anville, and his map indeed presents a great improvement of the latter. As to the material used by d'Anville, Klaproth informs us that it was not only the Lamas who furnished it, as is generally believed. He says:

Je dois observer que l'on croit à tort que la carte du Tubet, des jésuites, n'avoit d'autre base que le travail des deux lama, envoyés par Khang-hi dans ce pays. Ce travail fut rectifié par d'autres personnes que le même prince chargea d'examiner le Tubet, et d'après les routiers des armées mandchoues qui, sous son règne, y rétablirent la tranquillité.¹

Klaproth's great map of 1836, which was published the year after his death, was the final result of the deep and serious studies and researches of a life-time. He examined in a critical way and compared with one another all European and Oriental sources, old and recent, and it is, therefore, with respect and admiration we have to regard the map which contains the result of his laborious work. Many years before it was ready for print, he had collected material for detailed sketch-maps on a large scale, two of which are to be found in reproduction in Vol. III, Pl. IV and Pl. V. I add to these as Pl. XXVIII his *Charte der Tibetanischen Provinz Kamu*, 1821, the original of which is drawn by him on a scale of 1:2 000 000 (73×54 cm.). It shows an approximate knowledge of the great river systems, and of the names of the source branches of the Yellow River. The greatest difficulties he has encountered regarding the orographical systems, of which only the Bayan-chara

¹ *Nouv. Annales des voyages*, Deuxième série, Tome VII. Paris 1828, p. 270.



Charte der Tibetischen Provinz Kamu, 1821. (Handzeichnung von Jul. von Klaproth). 1:2.000.000. (State Library of Berlin).

CHAPTER XIX.

ALEXANDER VON HUMBOLDT.

In a preceding chapter we have already dealt with ALEXANDER VON HUMBOLDT'S views regarding the great mountain systems of Asia.¹ Here only a few quotations from his works may be sufficient.

In 1829 Humboldt accomplished his journey to the Kirgiz steppes and Altai,² the most important result of which was his great work, *l'Asie Centrale* written in a scientific and methodic way and which is full of new perspectives and brilliant ideas. But already several years before this journey he had directed his attention to the question of the mountain ranges of Central Asia. In 1816 he published an article on the height of the mountains to the north and N. W. of India.³

Here he speaks of the difficulty of measuring the height of mountains situated far from the coast, amongst others »cette chaîne immense qui, sous les noms de Hindoo-Coosh et l'Himalaya, s'étend depuis Herat et Caboul, à l'est de l'Indus, jusqu'au-delà du Bourampouter.»⁴

The necessary material for his conclusions he gathers from ELPHINSTONE, MACARTNEY, CRAWFORD, WEBB, COLEBROOKE, and MOORCROFT. In connection with the researches of the latter, Humboldt expresses the following very sound view regarding the morphology to the north of Himalaya: Il est impossible de réfléchir sur le résultat de ces mesures, sans se demander si derrière le groupe de montagnes de l'Himalaya il ne se trouve pas quelque autre chaîne encore plus élevée.

He feels convinced of the existence of an enormous plateau-land in the interior of Asia, the plateau-land of Tartary, a large part of which has, however, a very insignificant height:

¹ Vol. III, p. 77, et seq.

² *Reise nach dem Ural, dem Altai und dem Kaspischen Meere . . .* von A. von Humboldt, G. Ehrenberg und G. Rose. Berlin 1837, 2 Vols.

³ *Sur l'élévation des montagnes de l'Inde.* — *Annales de Chimie et de Physique*, Rédigées par MM. Gay-Lussac et Arago. Tome III. Paris 1816, p. 297 et seq.

⁴ Humboldt uses the spellings Hindoo-Coosh, Hindo-Kho, and Hindou-Kouh, i. e. Black Mountains in Persian, or Indian Caucasus. For Himalaya he has also the forms Hemälleh, Himälch or Hemmachal. Imaus of the ancients.

Dans l'Asie Centrale, les montagnes paraissent, au premier abord, former un massif immense, dont la surface égale celle de la Nouvelle-Hollande. Il y a depuis le Daourie jusqu'au Belour-tâgh, de l'est à l'ouest, 47° en longitude; et depuis l'Altai jusqu'à l'Himâlaya, du nord au sud, 20° en latitude. C'est ce massif que l'on appelle si vaguement le plateau de la Tartarie, quoiqu'il présente, surtout dans son extrémité occidentale, de grandes inégalités, comme l'indiquent les productions et le climat de la Songarie, de la petite Boucharie, du Turfan et du Hami (Chamul, Chamil), célèbre par ses raisins. On peut admettre avec beaucoup de probabilité que ce plateau ne forme aucunement une masse continue mais que plus du tiers de son étendue a une élévation peu considérable au-dessus du niveau de l'Océan.

Again in the same article¹ he returns, in a more precise form, to the question about still unknown rangés beyond the Himalaya. He suggests the existence of three or four principal mountain systems, a problem to which he paid his attention in a more elaborate way after his own journey to the Altai:

Depuis que nous connaissons, par les travaux précieux de MM. Crawford, Macartney, Colebrook et Webb, la hauteur de l'Himalaya, on se demande avec un intérêt bien vif, s'il existe au nord de l'Himâlaya d'autres chaînes de montagnes plus élevées encore. Lorsque plusieurs chaînons sont parallèles entr'eux, aucune analogie ne force d'admettre que les chaînons intérieurs sont plus élevés que les extérieurs. D'après la connaissance imparfaite que nous avons jusqu'à ce jour de cet immense système de montagnes, il paraît divisé en trois ou quatre rangées principales, qui, en partie parallèles entre elles, se dirigent à-peu-près de l'est à l'ouest.

In Humboldt's description of the four great ranges of Asia, he expresses some very interesting views in connection with the second one from the south. Here he correctly suggests that the Mus-tagh and the Kara-korum are one and the same range, though he curiously enough confounds it with the Tian-shan. He wonders whether this range of Mus-tagh continues eastwards including the Kailas. This presumption is clever and perspicacious, though HUMBOLDT here may have been influenced by KLAPROTH. The country is perfectly unknown, and still he finds the right solution of the orographical problem. The passage runs:

La chaîne du Mustag (Mouz-tâgh, en turc montagnes de glace) ou mont Karakurram, le Siouechan ou Tien-chan des Chinois; dans le Turkistan, les monts Pamer, forment comme une prolongation du Mustag vers la Sogdiane, le site d'une ancienne civilisation. On ignore si le Mustag, qui, au nord de Ladac, vers le mont Kentaisse, se dirige à l'est, continue jusque dans le méridien de Lassa, Lat. 38—39.

In the west these different chains are combined and limited by a »digue transversale«, the Belur-tagh or Cloudy Mountains, and between the ranges plateaux and valleys are extending. Here again he approaches the truth nearer than he did some 28 years later, suspecting the existence of a great mountain system which in 1908 was proved really to exist as an uninterrupted fold of the earth's crust:

Entre l'Himâlaya et le Moustagh, le plateau du Thibet (le Petit Thibet, Ladac ou Ladauk, le Grand Thibet). Si, comme le supposent quelques géographes, le Moustagh ne

¹ Loc. cit., p. 308.

se prolonge pas à l'est jusqu'au méridien de Lassa, le plateau du Grand Thibet pourrait bien se confondre avec le plateau de la Mongolie.

Another fundamental truth is expressed by Humboldt in the following words:

En parcourant les descriptions qui ont été données, depuis Strahlenberg et Pallas, des régions peu connues entre l'Altai et l'Himalaya, on voit qu'à l'ancien système d'un noeud central qui envoie des rangées de montagnes, comme des rayons, dans toutes les directions, on a substitué l'idée de chaînons à-peu-près parallèles entre eux.

He regards the plateaux of Central Asia as immense plains. He correctly remarks that the heights of the ranges should not be estimated from the heights of the highest peaks. From the difference in height of the elevated peaks of different ranges, one cannot get any idea of the average height of those ranges.

A few years later, 1820, he discusses the journey of WEBB to Hundes which he now believes is a part of the Great plateau of Tartary.¹ Lake Manasarovar he compares with Lake Mica which he had also found to be situated on a plateau, viz. that of Antisana, and where he had found a height of 4,107 m. He again mentions the range which nowadays may be regarded as a connecting link between the Kara-korum and the Transhimalaya: C'est au nord des Lacs Sacrés que se prolonge de l'est à l'ouest, le chaînon le plus septentrional dont le Kailas fait partie, et que M. Hamilton croit plus élevé que les sommets déjà mesurés.

In his article, *Mémoire sur les chaînes des montagnes et sur les volcans de l'Asie intérieure*,² Humboldt sets forth in a very graphic way his views regarding the framework or skeleton of the orography of Asia. The same views return in *Fragmens Asiatiques*, Paris 1831. Here Humboldt says that the interior of Asia should be regarded neither as an immense knot of mountains, nor as an uninterrupted plateau. For it is crossed by four mountain systems: Altai, Tian-shan, Kwen-lun and Himalaya.³ He dislikes the name »Moussart», »Moussour» or »Mouz-tagh» instead of Tian-shan, as this name, »est attribué arbitrairement tantôt au Thian-chan, tantôt au système du Kuen-lun, entre Ladak et le Khoten». The Bolor or Belour-tagh is a range, the southern part of which joins the Kwen-lun System and forms a part of the Ts'ung-ling, a definition which is not and cannot be quite clear. »La chaîne du Kuen lun ou Koulkoun, nommé aussi Tartach-davan, est entre Khotan, entre le noeud de montagnes de Khoukhounoor et du Tibet oriental, et la contrée appelée Katchi.» In a note he says: »Le nom de Tartach-davan s'applique de même à la continuation occidentale de cette chaîne nommé Thsoun ling par les Chinois.» Thus

¹ Sur la limite inférieure des neiges perpétuelles dans les montagnes de l'Himalaya et les régions équatoriales. — *Annales de Chimie et de Physique*. Tome XIV. Paris 1820, p. 5 et seq.

² *Nouv. Annales des voyages*. Tome IV. Paris 1830, p. 217 et seq. This article is accompanied by notes of Klaproth. The article is illustrated by the same little map that I have reproduced as Pl. VIII in Vol. III and which is entered once more as Pl. XXIX, in the present volume for the sake of more comfortable comparison with the later version of the same map, Pl. XXXII.

³ *Fragmens Asiatiques*, I, Paris 1831, p. 24 et seq.

Tartach-davan is the western part of Ts'ung-ling. And Tartach-davan is also the same as Kwen-lun. Before, it was said that Bolor is also a part of Ts'ung-ling. This orography is not clear. The great difficulty has been to define Ts'ung-ling. Even in the following words it is uncertain: Du Thsoug ling, le Kuen lun file de l'ouest à l'est.

Of the western Himalaya, Humboldt says that it seems to form only one single mass of mountains together with the Hindu-kush and the Ts'ung-ling. This, and the following view are nearly correct:

De même l'espace entre l'Himâlaya et le Kuen-lun est plus resserré par des chaînes secondaires et des masses de monts isolés, que ne le sont les plateaux entre le premier, le second et le troisième systèmes de montagnes. The great importance of and even the existence of a Kara-korum System does not at all appear. So for instance: Ainsi le Kuen-lun peut être considéré comme un débris saillant de l'Himâlaya. L'espace intermédiaire, comprenant le Tibet et le Katchi, est coupé par de nombreuses fentes dans toutes sortes de directions.

This arrangement does not quite agree with the little sketch-map Pl. XXIX, where the Kara-korum is entered between the Kwen-lun and the Himalaya. On this map we find that his Mouz-tagh is the same chain as his Thian chan. The extraordinary relation between the latter range and the Bolor-tagh, as Humboldt conceives it, he expresses thus:

Le prolongement occidental du Thian chan ou Mouz tagh, comme l'appellent par prééminence les rédacteurs des mémoires du sultan Baber, mérite un examen particulier. Au point où le Bolor ou Belour-tagh se joint à angle droit au Mouz tagh, ou traverse même comme un filon ce grand système, ce dernier continue à se diriger sans interruption de l'est à l'ouest sous le nom d'Asferah-tagh, au sud du Sihoun, vers Khodjend et Oura-tepneh, dans le Ferghana.

La chaîne transversale du Belour, Bolor, Belouth ou Boulyt est si âpre et si impraticable qu'il ne s'y trouve que deux cols qui, depuis les temps les plus anciens, ont été fréquentés par les armées et les caravanes: l'un au sud entre Badakchan et Tchitral, et un autre au nord à l'est d'Ouche aux sources du Sihoun.¹

Of the Kwen-lun System he says:

Ce système se rattache à la chaîne transversale de Bolor, et suivant les livres chinois, en forme la partie méridionale. Ce coin du globe entre le petit Tubet et le Badakhchan, riche en rubis, en lazulite et en Kalaïte, est très peu connu; et, suivant des renseignements récents, le plateau du Khorassan qui se dirige vers Hérat, et borne au nord l'Hindou Kho, paraît être plutôt une continuation du Thsoug ling et de tout le système du Kuen lun à l'ouest, qu'un prolongement de l'Himâlaya, comme on le suppose communément. Du Thsoug ling, le Kuen lun file de l'ouest à l'est, vers les sources de Houang ho, et pénètre, avec ses cimes neigeuses, dans le Chen si, province de la Chine.²

He denies the parallelism between the Himalaya and the Kwen-lun. Of the former he says:

¹ *Nouv. Annales des voyages*. Tome IV. 1830, p. 241.

² Loc. cit., p. 244.

Il s'en rapproche tellement . . . , que entre Kaboul, Kachemir, Ladak et Badakhchan, l'Himalaya semble ne former qu'une seule masse de montagnes avec l'Hindoukho et le Thsoug ling.¹ De meme l'espace entre l'Himâlaya et le Kuen-lun est plus reserré par des chaînes secondaires et des masses de monts isolés, que ne le sont les plateaux entre le premier, le second et le troisième systemes de montagnes.

According to Humboldt, two considerable rivers, the Indus and Tsangpo, indicate, in the N. W. and S. E. of the Tibetan plateau-land, a fall the axis of which is situated near the meridian of Djavahir, Lake Manassarovara and Lake Ravana Hrada, and Mount Kailas. Different ranges take their origin from this knot: the range of Kara-korum Padishah stretching to the N. W., north of Ladak, in the direction towards the Ts'ung-ling, and farther, the snowy ranges of Hor (Khor) and Zzang, stretching to the east. The Hor range joins the Kwen-lun in the N. W., and continues eastwards to the Tengri-nor. South of it the Zzang range runs, along the valley of the Tsangpo to the east towards Nien-tsin-tangla.

Humboldt himself was quite aware of the provisional character of the orographic system he has described in the passages quoted above:

En attendant le moment ou M. Klaproth répandra une nouvelle lumière sur cette étude par un ouvrage special, le tableau que j'ai présenté plus haut, des quatre systèmes de montagnes qui se dirigent de l'est à l'ouest, et dont le savant que je viens de nommer a fourni une grande partie des matériaux, ne sera pas sans utilité.

To the little map (Pl. XXIX) accompanying his memoir, Humboldt has the following interesting note, proving that he has made use of the most important material existing at his time, and has not contented himself with constructions of his own:

La carte des chaînes de montagne et des volcans de l'Asie intérieure jointe a ce mémoire, n'est qu'une ébauche destinée a faciliter l'intelligence de cet écrit. Les bases de mon travail ont été, autant que la petitesse de l'espace me l'ont permis, *l'Asie gravée par M. Berthe* en 1829; la petite *Carte de l'Asie centrale* de Klaproth, qui se trouve dans le Tome II des *Mémoires relatifs à l'Asie*; la carte de l'intérieur de l'Asie, en russe par Pansner; la carte du voyage de Meyendorff en Boukharie; la carte de Waddington jointe aux *Mémoires du Sultan Baber* (en anglais); l'esquisse d'une partie du step des Kirghiz par Meyer, dans le voyage de Lédebour à l'Altaï; enfin quelques cartes et des itinéraires

¹ In his *Analyse critique* of Humboldt's *Fragmens*, LARENAUDIÈRE gives a good review of the great German scholar's orographical system:

Le système du Kuen-lun commence a l'ouest, selon M. de Humboldt, au Thsoug-ling, monts des Ognons ou Bleus Le Kuen-lun se rattache a la chaîne transversale du Bolor Suivant les renseignements reçus le plateau du Khorassan qui se dirige vers Herat, paraît être plutôt une continuation de tout le système du Kuen-lun a l'ouest, qu'un prolongement de l'Himâlaya. Nous arrivons a cette chaîne qui sépare les vallées de Sirinagour ou Gherwal, du Nepal et du Boutan de celles du Tibet, qui semble ne former, a l'ouest, qu'une seule masse avec l'Hindou-koh et le Thsoug-ling — *Nouvelles Annales des voyages*, Tome I, Paris 1832, p. 370. — Three years later the same Journal abandoned this view. In a note to *Voyages par les monts Himâlaya, etc.* par C. JOHNSON 1827 it is said: La grande chaîne de l'Himâlaya s'étend du nord-ouest au sud-est, sur une longueur d'environ 2000 milles anglais. Sa continuation a l'ouest appelée aujourd'hui l'Hindou-Couch ou montagnes de l'Inde, et regardée par M. de Humboldt comme un prolongement du Kuen-Lun, était l'Emodus des Macédoniens, et l'Imaüs de Pline. *Nouv. Annales des voyages*. Tome III. Paris 1835, p. 172.



Nouvelle Carte de l'Asie dressée par A. R. Fremiss. Publiée par
L. H. Berthe, Graveur. Paris 1829.

GEN. STAN. LIT. ANST. STERN

manuscripts, recueillis en Sibérie. La position des volcans de l'Asie centrale qui ont été placés avec soin, et la fixation de quelques hauteurs au-dessus et au-dessous du niveau de l'Océan, donnent peut-être un certain intérêt à ma première ébauche d'une carte des chaînes de montagnes de l'Asie, et la distinguent de toutes celles qui ont été publiées jusqu'à présent.¹

I have not been able to find a copy of the map of PANSNER. As to the map illustrating the work of MEYENDORFF, it falls outside and too far west of our region, whilst the map of LÉDEBOUR is much too far north. The map of WADDINGTON has been discussed above (Pl. XXVI). The two remaining maps with which Humboldt begins his list of sources, are of such great interest that I have thought necessary to have them reproduced.

Comparing Humboldt's little sketch-map, Pl. XXIX,² with *l'Asie gravée par M. Berthe en 1829*, Pl. XXX,³ it must be said that the resemblance is very great so far as the orographical and hydrographical systems are concerned. The rivers are exactly the same, for instance, the courses of the Tsangpo, the Indus and the Tarim. The mountains north of the Tarim Basin are called Moussour by FREMISS and BERTHE, Thianchan by HUMBOLDT. Pamir and Bolor are about the same in both cases, though Humboldt has given the latter range a S. S. W. direction instead of S. S. E., which was no improvement. The map of 1829 has M. Karangoui as a ramification from the southern part of the Bolor Range at the same place where Humboldt has entered the name Tsoungling. Fremiss-Berthe have only the eastern part of the Kwen-lun, and in the west M. Karakorum Padichah borders directly upon the Tarim Basin. The western prolongation of the Kara-korum is the Hindoukouch. Here Humboldt has improved the situation by sketching the Kouenloun or Kwen-lun north of the Kara-korum. To the east and E. S. E. the Kara-korum, on the map of 1829, seems to stand in a certain relationship to a range situated between the names Katché and Khor, which also are entered on Humboldt's map, where, however, the range itself is a ramification from the Kwen-lun without any contact whatever with the Kara-korum. Here Humboldt is more in accordance with the truth, for his Kara-korum continues eastwards in the Kaylas and Dzang ranges and his map, therefore, indicates the relationship between the Kara-korum and the mountains north of the Tsangpo. On both maps the mountainous country in the west, between the Indus and the Yarkand-daria, is too narrow, and therefore Humboldt could speak of a mountain knot where the Himalaya, the Kwen-lun

¹ Loc. cit., p. 289.

² *Chaînes de Montagnes et Volcans dans l'Asie-Centrale. (Enfoncement du sol dans l'Ouest.)* Essai par A. de Humboldt, Potsdam 1830, Gravé par Berthe. 33×21 cm.

³ *Nouvelle Carte de l'Asie dressée par A. R. Fremiss Revue pour la partie Septentrionale de l'Empire Chinois par J. Klaproth publiée par L. H. Berthe Graveur* Paris 1829. — I suppose it cannot be any other map that Humboldt means.

and the Ts'ung-ling came in contact with one another. It must be said that the map of Fremiss-Berthe, Pl. XXX, is very well drawn.

KLAPROTH'S fine little map, mentioned by HUMBOLDT, is here reproduced as Pl. XXXI.¹ The northern system he calls Mts. Thian chan ou Célestes, and Moussour appears as a part of it. The southern system is called M. O neu ta and farther east M. Kuen lun. These two systems are joined by a transverse range between two mountain knots and called Pamir in its northern part, Bolor in the middle and Thsoug ling in its southern part. This range runs from N. W. to S. E., which is correct, whereas Humboldt unfortunately changed this direction, as I have said above, to N. N. E.—S. S. W. The southern mountain knot is very sharply pointed out by Klaproth. Five different ranges start from it: The Thsoug ling, the Hindoukouch, the Himalaya, the Kuen lun and a nameless range. The orographical skeleton thus given by Klaproth has, to a certain extent, influenced Humboldt.

In the German edition of Humboldt's work quoted above we find some itineraries in Central Asia.² One of these passes from Yarkand to Leh, thus crossing the Kara-korum Pass, though this is not mentioned:

Es sind 40 Tagereisen, jede von 10 Werst; eine schnellere Reise über die äusserst hohen Berge, welche man passieren muss, ist unmöglich. Von Jarkend bis zum Chinesischen Wachtposten Kok-yar — 50 Werst.

Der Weg geht zwischen zwei sehr hohen Bergen.

Von Kok-yar bis zur Ueberfahrt des Flusses Schayuk — 280 Werst.

Dieser Fluss ist ziemlich breit; er fliesst in den Bergen von Ost nach West. Die Strasse geht über hohe Berge weiter. (Der Schayuk ist der grosse Fluss, welcher seine Quelle südlich von den hohen Bergen von Kara-korum hat; er fliesst anfangs südöstlich, dann südwestlich und ergiesst sich bei Lei oder Ladak in den Indus. Klaproth).

Vom Schayuk zwischen äusserst hohen Bergen nach Tübet — 70 Werst.

Die Stadt ist ziemlich gross, steht unter Indischer Oberhoheit und ist die Residenz eines Radjah.

Die Gebirgskette von Jarkend nach Tübet zieht mehr gegen Westen als gegen Osten.

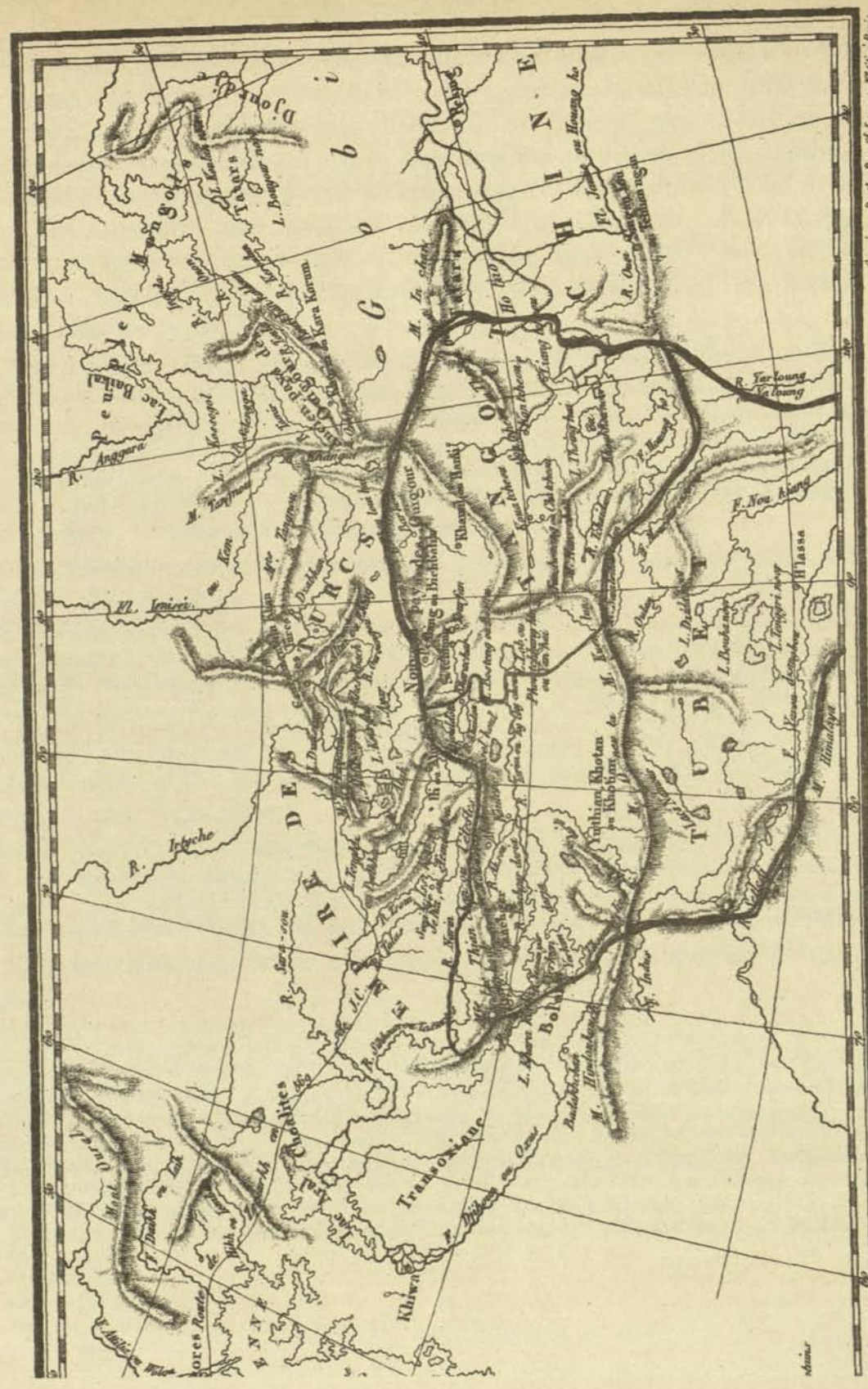
400 Werst = 57 Meil.

Zwanzig Tagereisen über das hohe Gebirge nach Ost-Tübet ist Tschabé Tschaptan; von hier führt man nach Kaschmir die berühmte Schaafwolle.³

¹ *Carte de l'Asie Centrale* par M. J. Klaproth. — *Mémoires relatifs à l'Asie*, Tome second, Paris MDCCCXXVI, p. 362. — This map was also engraved by Berthe.

² *Fragmente einer Geologie und Klimatologie Asiens. Aus dem Französischen . . .* von Julius Loewenberg. Berlin 1832, p. 116.

³ In several narratives and geographical works of this epoch the great trade route from Central Asia to Kashmir and India is mentioned. So, for instance, PUTIMTSEFF found on his journey, 1811,



Carte de L'Asie Centrale par M. J. Klaproth, 1826.

GEN. STAB. LIT. ANST. STEDM

Gravé par Berthe, Rue St. Jacques, N° 65, à Paris.
Édité par la nouvelle carte d'Europe en 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552, 554, 556, 558, 560, 562, 564, 566, 568, 570, 572, 574, 576, 578, 580, 582, 584, 586, 588, 590, 592, 594, 596, 598, 600, 602, 604, 606, 608, 610, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, 676, 678, 680, 682, 684, 686, 688, 690, 692, 694, 696, 698, 700, 702, 704, 706, 708, 710, 712, 714, 716, 718, 720, 722, 724, 726, 728, 730, 732, 734, 736, 738, 740, 742, 744, 746, 748, 750, 752, 754, 756, 758, 760, 762, 764, 766, 768, 770, 772, 774, 776, 778, 780, 782, 784, 786, 788, 790, 792, 794, 796, 798, 800, 802, 804, 806, 808, 810, 812, 814, 816, 818, 820, 822, 824, 826, 828, 830, 832, 834, 836, 838, 840, 842, 844, 846, 848, 850, 852, 854, 856, 858, 860, 862, 864, 866, 868, 870, 872, 874, 876, 878, 880, 882, 884, 886, 888, 890, 892, 894, 896, 898, 900, 902, 904, 906, 908, 910, 912, 914, 916, 918, 920, 922, 924, 926, 928, 930, 932, 934, 936, 938, 940, 942, 944, 946, 948, 950, 952, 954, 956, 958, 960, 962, 964, 966, 968, 970, 972, 974, 976, 978, 980, 982, 984, 986, 988, 990, 992, 994, 996, 998, 1000.

Several years later Humboldt published his famous work *Asie Centrale*,¹ where he again returns to the important question of the orographical building of the great continent. The system of the Kwen-lun bordering the Tibetan plateau-land to the north, is, in respect to the continuity of its crest and the parallelism of its stretching, the most important orographical phenomenon amongst all the ranges of the old world. As to the plateau-land between Himalaya and Kwen-lun, he believes that its average height does not reach the height of the Titicaca Lake (2000 Toises), nay, perhaps not even 1800 Toises. And still the Titicaca is 3,812 m high, and the Tibetan plateau-land 4,800 to 5,000 m.

In this work Humboldt regards the Kara-korum as a part of the Kwen-lun:²

Der Name, welchen das Westende des Kuen-lun auf der neuesten Karte von Lieut. Burnes und John Arrowsmith führt (Kette von Karakorum) ist nur von einem Engpasse hergenommen, welchen die Chinesischen Karten genau in 36° Br. setzen und wo sich der Punkt der Wasserscheide zwischen dem nach S. fliessenden Schayuk und dem nach N. gerichteten Yarkand befindet Mehrere Gipfel der Kette reichen dort in die Region des ewigen Schnees. Weiter östlich durchzieht der Kuen-lun ganz Asien

In the following words he expresses his conviction that the Kara-korum Pass is situated on the Kwen-lun:³

Der Alpenpass am Fusse von Bergen, deren Höhe an 3000 T. zu betragen scheint, bildet die Wasserscheide zwischen dem Strome von Yarkand und dem Schayuk, der nördlichen Quelle des Indus (San-pu). Die Reiseberichte machen es sehr wahrscheinlich, dass die divortia aquarum auf dem Kamme des Kuen-lun selbst, unter 35° 50' Br. und 75° 45' Lg. liegt.

Later on⁴ he again says expressly that the Kara-korum Pass forms the water-parting of the crest of the Kwen-lun. He makes one system of the Kwen-lun and Kara-korum — and Ts'ung-ling:⁵

Der alte Name A-nëu-ta begreift den Theil der Kette des Kuen-lun oder Ts'ung-ling, den man auf den neuern chinesischen Karten Eschimetis-tak, Keria-dabahn und Tsatsa-dabahn nennt. Die beiden letztern Namen zeigen die Pässe (cols) des nördlichen eisigen Tübets, Ngari-sangkar und Ngari-tamo, an, welche zum Becken von Khotan und Keria führen.

This misunderstanding is the more surprising as he has a Kara-korum Range on his map.

to Kulja and Ili that these regions had a considerable trade with Kashmir and India. — Klaproth, *Magasin asiatique*, Janvier 1826, p. 173. — C. F. VON LEDEBOUR, on the other hand, maintains that the trade from Semipalatinsk on this road is not so important as it could be: Der Handel nach Kaschmir ist weniger bedeutend, als er es wohl seyn könnte. Man holt von dort her theure baumwollene Tücher, Shawls und dergleichen Artikel mehr, die meistens mit taschkentischen, kokanischen, buckarischen Dukaten bezahlt werden, da der Weg zu weit und zu unsicher ist, um Waare hinzubringen. — *Reise durch das Altai-Gebirge und die Zoongarische Kirgisen-Steppe*, II, Berlin 1830, p. 508.

¹ The German edition, which was published in Berlin in 1844, was translated by Dr. W. Mahlmann.

² Op. cit., p. 100.

³ Op. cit., p. 599.

⁴ Op. cit., p. 607.

⁵ Op. cit., p. 601.

Humboldt must have had too much confidence in Kien Lung's maps. He does not believe in the Hindu-kush as being a continuation of the Himalaya. Ich bestreite nicht nur.... die Behauptung, dass der Hindu-kho die Fortsetzung des Himalaya sei, dessen Richtung östlich von der Bolor-Kette N. W—S. O ist; sondern ich bestreite hauptsächlich hier, dass die Kette von 36° oder die welche Kafiristan im N. begrenzt und welche ich den nördlichen Hindu-kho nenne, am Nord-Abhange von S. W. nach N. O. und nicht von O. nach W. laufe. He finds it a pity that for such a long time no attention had been paid to the »Asiatic range» (Elburs, Hindu-kush, Kwen-lun) and that the part east of Bolor, which the three Tibets bound towards the north, is missing on almost all maps, even if they show the part of the Hindu-kush which is west of Bolor as a continuation of the Himalaya.¹ Humboldt regards the meridional Imaus as identical with the Bolor.²

He quotes Dr. LORD³ who, like so many of the time, believed in a high plateau-land of Central Asia north of the Himalaya. He could have added G. W. TRAILL who speaks of the »Table land of Tartary» north of the Himalaya,⁴ that is to say: there is no sign of Transhimalaya or Kara-korum.

It is quite touching to read what Humboldt says at the end of the chapter about Kwen-lun and Himalaya:⁵ Nichts hat mich in meinem Leben mit lebhafterem Bedauern erfüllt, als dass es mir nicht vergönnt gewesen, selbst in jene berühmten Regionen einzudringen, wo ich ihr Verhältniss zu den Cordilleren der Neuen Welt erforschen wollte.... Das ist das Geschick des Menschen: Am Ziele seines Lebens stehend, vergleicht er nicht ohne Betrübniß das Wenige, was er geleistet hat, mit dem, was er zur Vergrößerung des Gebiets der Wissenschaften gern hätte unternehmen mögen. At the same time he condemns⁶ the custom to compile without criticism, and to fill up the blank spaces and join heterogeneous materials which give a false resemblance of accurateness to geographical works and maps of regions, which least of all have been visited by Europeans.

But even at an age when he had lost the force to undertake any difficult journeys, Humboldt had the same indefatigable interest in the great Asiatic problems and tried to direct the attention of others to them. Thus he gave HOOKER some important hints for a traveller in the Himalayas, amongst which was the following:⁷ Si l'on est assez heureux de traverser la grande Cordillère de Kouen-lun pour arriver à Yarkand, en remontant vers les sources du Chajouk, affluent de l'Indus,

¹ Op. cit., p. 597.

² Op. cit., p. 116.

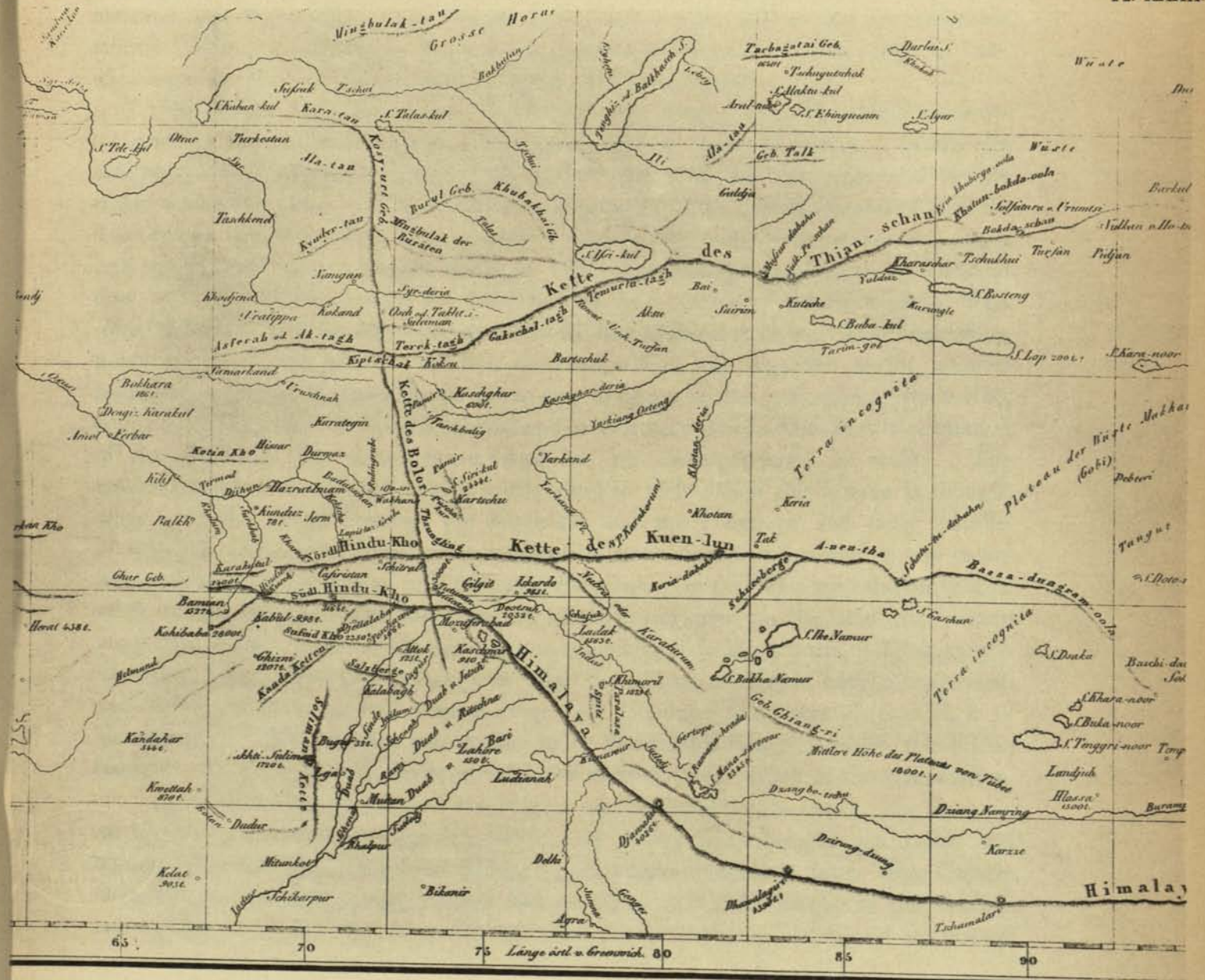
³ *Journal Asiatic Society of Bengal*, June 1838, p. 522, 527.

⁴ *Statistical Sketch of Kamaon. Asiatic Researches*, Vol. XVI. Calcutta 1828, p. 160.

⁵ Op. cit., p. 611.

⁶ Op. cit., p. 23.

⁷ *Journal Asiatic Society of Bengal*, Vol. XVII, part I, Calcutta 1848, p. 324.



Gebirgsketten und Vulcane in Central-Asien. Von A. v. Humboldt 1844.

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être bien attentif au *peu* de hauteur de la plaine qui envoie les eaux à l'est, par le Tarem au Lac Lop....» He regarded as a desideratum of exploration, to reach the sources of the Shayok, where his theory should be confirmed. He seems to have believed that the feeders of the Tarim came from a plain with a very inconsiderable height. This is surprising as he had the greatest admiration for MIR IZZET ULLAH, who was the first reliable traveller to cross this very region.

Humboldt's little sketch-map of Central Asia from 1844, Pl. XXXII,¹ cannot be said to be an improvement of the same map of 1830, Pl. XXIX. »Kette des Bolor« has a tremendous length both to the north of the Tian-shan and to the south of the Himalaya, but its direction is improved to the S. S. E. instead of S. S. W. The Pamir, which in 1830 was correctly placed to the west of Bolor, is now, 1844, east of it, and quite close to Kashgar. South of Kashgar and west of Yarkand there is a second Pamir with the Lake Siri-kul as a source of the Amu-daria. This river, therefore, is believed to pierce the Bolor in a transverse valley. The Thsungling keeps its ground as before. In 1830 the Hindou Koh was regarded as the western continuation of the Kouen-loun or Kwen-lun, in 1844 he has a Southern Hindu-Kho, being a prolongation of the Himalaya, and a Northern Hindu-Kho as a continuation of the Kwen-lun, an arrangement that has no correspondence in reality. The representation of the Kara-korum is much better in 1830 when this system is thought of as a special range between the Kwen-lun and the Himalaya and fairly parallel to them; in 1844 it is drawn as a ramification from the Kwen-lun and is now called Nubra or Karakorum instead of Karakorum Padichah. On the older map the mountains north of the Tsangpo approached reality much nearer than on the later map, where Humboldt seems to believe that there are no ranges at all in these parts of Tibet, only a flat plateau-land. The Dzung Range of 1830 as well as the Kailas have disappeared, and instead of them we find a small range Geb. Ghiang-ri at a great distance N. E. of Manasarovar. This probably was meant to be the Kangri Range to which the Kailas belongs. This range is also represented as an indirect prolongation of the Kara-korum.

It is interesting to examine the heights on Humboldt's little map.² For Kashgar he has 1,169 m. and for Lop-nor 390 m.; in reality these heights are 1,304 and 816 m. For the Lake Sirikul he has 4,763 m., which probably is taken from Captain WOOD'S observations, giving 15,600 feet or 4,756 m.³ The height of this lake is now given as 13,390 feet or 4,082 m.⁴ For Ladak (Leh) he has 3,046 m. instead

¹ Its complete title runs: *Gebirgsketten und Vulcane in Central-Asien nach d. neuesten Astronom. Beobachtungen u. Höhenmessungen*. Von A. v. Humboldt. 1844. Gez. v. A. v. Humboldt beendigt v. C. Petermann 1841. Gest. zu Berlin v. H. Mahlmann. Berl. 1844. 54×31 cm. 1:12000000.

² They are given in toises, one toise being 1,949 m. I have changed the toises into meters.

³ *Journal Roy. Geogr. Soc.* Vol. X, 1841, p. 536.

⁴ *Map of the country on both sides of the boundary line drawn by the Joint Commission for delimiting the Russian and Afghan territories on the Pamirs 1895.*

of 3,430 m., and for Skardo 1,919 instead of 2,698 m. The absolute height of Manasarovar is nearly correct with 4,570 m. instead of 4,602 m., but the average height of the Tibetan plateau-land he has too low or at 3,508 m., instead of about 4,900 m. All these heights, with only one exception, *viz.* Lake Sirikul, are too low, proving that still so late as 1844 the general characteristic features of High Asia, both hypsometrical and morphological, were very little known.

Humboldt lived long enough¹ to witness the discoveries of the SCHLAGINTWEIT brothers. In his great work *Kosmos* he could therefore mention the fact that the Kara-korum and the Kwen-lun were two different systems, the former being the water-parting, the latter being pierced by the rivers:

Den Brüdern Hermann und Robert Schlagintweit ist zuerst die Kühnheit geglückt von Ladak aus die Kuen-lün-Kette zu überschreiten und in das Gebiet von Khotan zu gelangen: in den Monaten Juli und September 1856. Nach ihren immer so sorgfältigen Beobachtungen ist an der nördlichen Grenze von Tibet die höchste wasserscheidende Bergkette die, auf welcher der Karakorum-Pass (17170 Par. Fuss) von S. O. nach N. W. streichend also dem südlich gegenüberstehenden Theile des Himalaya (im Westen von Dhawalagiri) parallel, sich befindet. Die Flüsse von Yarkand und Karakasch, welche das grosse Wassersystem des Tarim und Sees Lop theilweise bilden, haben ihren Ursprung an dem nordöstlichen Abhänge der Karakorum-Kette. Von diesem Quellgebiete gelangten sie über Kissilkorum und die heissen Quellen (49° C.) an dem kleinen Alpensee Kiuk-kiul an die ost-westlich streichende Kette des Kuen-lün.²

Still he believed in the Hindu-kush as a continuation of the Kwen-lun System, which was supposed to cross the Bolor in the Ts'ung-ling:

Ich habe wahrscheinlich gemacht, dass der Hindu-Kho von Chitral und Kafiristan eine westliche Fortsetzung des mächtigen, Tibet gegen Norden begrenzenden, das Meridian-Gebirge Bolor im Tsungling durchsetzenden Kuen-lün ist.³

As has been shown above, Humboldt, in the years of his strength and undefatigable work, placed the Kara-korum Pass on the Kwen-lun System, and it seems doubtful whether the journeys of the SCHLAGINTWEITS were sufficient to give him a clear idea of the situation.

RICHTHOFEN says on this matter:

Es war Humboldt's, nach ihm auch von Ritter vertretene Ansicht, dass der Kwen-lun in dem Theil, welchen wir jetzt als den westlichen bezeichnen, die Wasserscheide zwischen Indus und Tarym bilde, und der Karakorum-Pass in ihm eingesenkt sei. Zwischen ihm und dem Himalaya dachten sich die beiden Geographen ein, wenn auch nicht durchaus ebenes, so doch fortgesetztes Plateau. Sie konnten die Existenz mächtiger Gebirgszüge in dem Zwischenraum noch nicht ahnen.⁴

¹ He was born in 1769 and died in 1859.

² *Kosmos, Entwurf einer physischen Weltbeschreibung von Alexander von Humboldt*, Bd. IV. Stuttgart und Tübingen 1858, p. 611.

³ *Kosmos*, IV, p. 379.

⁴ *China*, I, p. 228.

RICHTHOFEN also shows that even after THOMSON'S journey, CUNNINGHAM regarded the Kwen-lun as a continuation of the range with the Kara-korum Pass, and that the SCHLAGINTWEITS were the first to separate the two systems.

The same scholar, who was the most erudite specialist on Asia of his time, has said the following true words of Humboldt:

Er hatte kaum den Westrand der Centralgebiete von Asien berührt, und doch war er der erste, welcher, indem er das mühsam von Anderen zusammengetragene Material vergleichend betrachtete, ein Gemälde von dem Gezimmer des Continentes entwarf, welches zwar mehrfacher Modification bedarf, aber doch hinsichtlich mancher Grundzüge in bewundernswerther Weise das Richtige traf.¹

Exactly the same may be said of RICHTHOFEN himself, for though he gathered and digested in the most brilliant way all material on Central Asia existing at his time, the orographical map he constructed had to be modified in many details. And, after all, cannot the same be said of our own time!

¹ *China*, I, p. 724.

CHAPTER XX.

CARL RITTER.

In preceding volumes of this work we have dealt with those passages in CARL RITTER'S gigantic work which describe the Sacred Lake and the Transhimalayan regions.¹ In this connection we have only to remember what he has to communicate regarding the Kara-korum System, which, as we have seen in the case of HUMBOLDT, could not be much at so early a date.² As a rule the two scholars had the same views regarding the great features of the orography of Asia, though Ritter enters more in detail and makes use of all information known at his time, both from the western and the eastern literature. On the whole he concludes from the narratives of British explorers that north of the snow-covered Himalaya there must be a great table-land, but he quotes KLAPROTH on the three ranges: Himalaya, Dzang and Khor, and he adopts Humboldt's ranges: Kara-korum, Dzang and Hor. In respect to the Kara-korum Pass he is of the same opinion as Humboldt and places it on the Kwen-lun Range. But still on the maps by L. GRIMM illustrating his great work on the geography of Asia, the Kara-korum System plays a much more important part than in the text. On a diagram by Grimm, reproduced as Pl. VII in Vol. II,³ we find the Karakorum Geb. as a well-defined system, and the Baltā-Glātscher as another. Above the latter there is a legend which seems to be taken from the orography of Humboldt: Gebirgs-Knoten des Kūenlūn, Karakorum und Thsung-ling. In the next volume we will see that Ritter regards the Ts'ung-ling as a part of the Kwen-lun, which is in immediate connection with, and even forms a part of, the transverse range of Bolor or Belur-Tagh.⁴

Ritter makes some interesting remarks on MIR IZZET ULLAH'S itinerary. The situation of the source of the Shayok is no secret to him: *Die Quelle des Shayuk-*

¹ Vol. II, p. 67 *et seq.* Vol. III, p. 83 *et seq.*, 90 *et seq. et passim.*

² RICHTHOFEN makes a brilliant comparison between HUMBOLDT and RITTER, and shows in classical words the importance of these two great scholars for geography as a science. *China*, I, p. 724. 725.

³ *Projections-Ansicht des Himālaya vom Hindu-kuh bis zum Langtan-Gebirg.*

⁴ *Die Erdkunde von Asien*, Band II, Dritter Theil. Berlin 1833, p. 411. — Cf. Vol. VIII.

Flusses liegt weiter im Norden, auf der Karakorum-Kette; er strömt gegen S. W. und ergiesst sich in den Indus (unterhalb Leh), zu dessen Anschwellen er nicht wenig beiträgt. Of the region N. E. of Digher he says: Hier beginnen offenbar mit dem durchbrechenden Felsthale des Shayuk, im wildesten Zick-zacklaufe, die südlichsten Vorketten des Kuenlun-Systems, welche dort den Namen Karakorum bei den Mongolisch-Türkischen Reisenden führen, und weiter gegen Ost hin auch Padischah-Kette (ob von der Kaiser-Strasse etwa, die sie übersetzen muss?) heissen.¹

Of the great continental water-parting Ritter says:²

Die Quelle des Schayuk liegt südlich von Karakorum: die des Flusses von Yarkand ist im Norden, durch die Bergkette von jener Flussquelle getrennt. Im Norden liegt das Königreich Khotan, im S. W. Tibet Balti. — Hier stehen wir also offenbar auf der Wasserscheide des Grossen Kuenlun-Systemes, zwischen den Tibetischen Plateau-Landschaften im Süden, und den Turkestanischen im Norden desselben.

In this passage we recognize Mir Izzet Ullah whose narrative Ritter quotes: »The source of the river Shayuk is on the south of Karakürüm, on the north is that of the river of Yarkand. The country of Khoten lies at twelve days' journey to the north. Tibet Balti lies to the south-west.»³

Between the Chinese empire and the kingdom of Ladak, Ritter places the Kwen-lun System and the ranges of the Kara-korum, which he seems to regard as more secondary:

Hier sind wir also bis zur politischen Grenze des Chinesischen Reiches vorgerückt, nach dem wir schon oben die Grenze des Königreichs Ladakh angedeutet hatten, und zwischen beiden das Kuenlun-System mit den Vorketten des Karakorum überstiegen, welches, hier, die grosse Naturgrenze zwischen Tibet und Turkestan bildet.⁴

¹ *Ibidem*, p. 633. Ritter here makes the curious mistake of believing that Karakorum and Padishah are two different parts, one western and one eastern of one and the same range. On Humboldt's little map of 1830, Pl. XXIX, the name Karakorum Padichah may easily be misunderstood as being two different names. I have not heard the name Karakorum Padishah during my journeys, nor does Mir Izzet Ullah mention it. But it may easily be correct and would probably indicate a kind of »masar» or tomb of a saint or only a heap of stones with some rags as a kind of offering to the powers of the mountains, much the same custom as in Tibet. The word Padishah, or Padshah as it is usually pronounced in Eastern Turkestan, means king and is often added to the name of some saint or other historical person, that does not need to have been a king. Sometimes it has the form Padshahim or »my king», as notre Seigneur or notre Dame. Southeast of Kashgar there is a Ordan Padshah and a Khorus Padshahim which I passed in 1896 (*Pet. Mit.*, Erg. Bd. XXVIII). Bellew has Ordám Padshah = »My King's palace», and he mentions Chúchám Padshah, a sacred shrine of the early champions of the Faith. (*Report of a Mission to Yarkund in 1873*. Calcutta 1875, p. 37). Mir Izzet Ullah says of his passage of the Kara-korum Pass: »The first half of the road was ascent, and the second half descent, and to mark the summit stones are piled, and sticks set up with the chowris of the cow-tail to them» (*Journal Roy. Asiat. Soc.* N° XIV. London 1843, p. 298). At my passage in 1902 I saw two cairns built on the pass, and the respectful expression of Karakorum Padshah is therefore not unlikely.

² *Ibidem* p. 636.

³ *Journal Roy. Asiat. Soc.* N° XIV, p. 298. The narrative of Mir Izzet Ullah had first been published in the *Calcutta Oriental Quarterly Magazine*, 1825.

⁴ *Ibidem* p. 639.

Speaking of the Indus at Leh Ritter says on a later occasion:¹

Dagegen solle der vom Norden herabkommende Shayuk-Strom ein sehr grosses Wasser seyn, das aus vielen kleinen entstehe, welcher die Schneeschmelze der Karakorum-Kette und ihre Wasser herabwälze gegen Süden, und 3 Tagereisen aufwärts von Leh schon eine Breite von 1000 Schritt (yard) besitze, aber eben deshalb auch durchgehbar sey. Die Landeseinwohner und auch andere Reisende, z. B. Czernicheff, und die Kaufleute sollen Shayuk als den Hauptarm des grossen Stromes, oder als den Indus selbst ansehen, dessen Quellen dann nicht am Fusse des Kailasa gegen S. O., sondern im N.-O. von Ladakh auf dem Kara-korum zu suchen wären, wo ihnen gegenüber die Quelle des Yarkand-Stromes, nordwärts laufend, derselben Höhe entspränge

In a translation from the Chinese made by Dr. SCHOTT, regarding the Siue-shan or Snow Mountain (Tian-shan, Ritter), the following passage is to be found: Der Ping Schan, d. h. Eisberg; er ist sehr gefährlich zu passiren, doch geht über ihn die Handelsstrasse von Yarkand nach Hindostan. Sein ewiger Schnee giebt dem Süden reiche Bewässerung.² To this Ritter adds: offenbar der Karakorum-Pass mit seinen Gletschern nach Ladakh.

Regarding Ladak Ritter chiefly follows the authority MOORCROFT. To the N. W. and north it borders upon a part of Balti or Little Tibet

— so wie an die Bergreihe Karakorum, welche das südliche Bollwerk und den Saum des Chinesischen Turkestan bildet; (also zum westlichen Kuenlun-Systeme gehörig) Obwohl dieses Tafelland, innerhalb seiner Grenzen, nirgends Berge von bedeutender Höhe hat: so ziehen doch an seinen Grenzen die Ketten des Himalaya im Süd, des Karakorum oder Muztagh mit Eisgletschern im Nord, und die Berge von Khotan im N. Ost hin, welche letztere noch ununtersucht sind, aber nach Moorcroft's gesammelten Nachrichten, in mehr irregulären Gruppen und Bergen sich an den Kailasa (oder Kantesee b. Moorcr. d. i. Kentaisse, d. i. Gang-dis-ri) südwärts anreihen. Das ganze Plateau, oder Tafelland, ist aber, auch nach seinem Inneren in einen beständig, mehr oder weniger abschüssigen Berg- und Thal-Wechsel gebrochen; es hat mehrere Erhabenheiten von beträchtlicher Höhe, und mehrere der Bergpässe sind schwer und gefährlich zu passiren. Daher wird das Land von einer Menge fliessender Wasser durchschnitten, die aus der Schneeschmelze und andern Quellen entstehen, und zu den beiden Hauptströmen Indus und Satledsch ihre Hauptwasser senden.³

This passage proves how Ritter penetrated and understood the physical geography of this very complicated region, and how he was able in a few words to describe it to others. The Kara-korum may indeed be said to be the southern bulwark of Eastern Turkestan, though he, following the example of Humboldt, regarded it to be a part of the Kuen-lun. He describes Ladak as a plateau-land between the Himalaya and the Kara-korum and identifies the latter with the Muztagh the »Ice Mountain« carrying the great glaciers. That the mountains of Khotan should be in any contact with the Kailas is, on the other hand, wrong, though there is, of course,

¹ *Asien*, Bd. V, Siebenter Theil, Berlin 1837, p. 13.

² *Ibidem* p. 453.

³ *Asien*, II. Berlin 1833, p. 616, 617.

a world of mountains between the Kwen-lun and the Transhimalaya. He finds it difficult to persuade himself that the country north of the Himalaya may be a plateau-land, for he says that this plateau-land is, at any rate, very accentuated and possesses high and dangerous mountains as well as valleys and that it is pierced by rivers. All this is in perfect agreement with the truth.

It does Moorcroft great credit that the information he was able to collect proved to be sufficient — with a few additions from other sources — for such a brilliant *résumé* of the physical geography. A few years earlier, or in 1828, Ritter had shown how late the Himalaya became known to Europe, which, of course, is still more true of the Kara-korum. After having mentioned the knowledge of the ancients he says:

Solcher früheren Berichte ungeachtet, bleibt diese Gebirgsform, die ganze Reihe der folgenden Jahrhunderte, während der Europäischen Colonisation in Indien, von Europa aus, fast gänzlich unbeachtet, und erst seit einer kurzen Reihe von Jahren wiederentdeckt, ist sie nun erst, wie durch einen Zauberschlag, sichtbar für die Wissenschaft hervorgetreten, für Erforschung und zur Kunde der civilisirten Völker gelangt....

Die Verwunderung, wie eine solche Grösse, die sich so hoch emporrichtet, so lange Jahrhunderte hindurch, nicht nur dem fernen Europa, sondern selbst dem näheren Anwohner am Fusse der Gebirgskette, so gut wie gänzlich unbekannt bleiben konnte, mildert der Rückblick nach unserem eigenen Erdtheil, in welchem auf ganz ähnliche Weise die grössten Hochgebirge der centralen Alpen selbst einem Scheuchzer und Peter Anich unbekannt bleiben, und zum erstenmale erst gegen die Mitte des vorigen Jahrhunderts entdeckt wurden. (Der Montblanc von dem berühmten Englischen Reisenden Pocock im Jahre 1741).¹

We have arrived at exactly the same conclusion in the preceding chapters dealing with the exploration in the Kara-korum. It is practically only a few decennia before Ritter's own time that the system begins to make its appearance on our maps, though nobody had ever represented it so well and so nearly correct as Ritter himself and his cartographers.

Vol. V. of Ritter's *Erdkunde von Asien* was published in 1837, and some new material and information had appeared in the course of these few years. One of these new contributions had been furnished by W. H. WATHEN, who had compiled a Memoir² based on the reports of the Mekka pilgrims in Bombay. From these reports and other material available at his time, Ritter has the following extract regarding the Kara-korum road,³ issuing from Yarkand: Nach Tübet, nämlich Ladakh, das nur dem Namen nach unter chinesischer Oberhoheit steht, sind 30 bis 40 Tage-reisen, in Eilmärschen 17—18 Tagereisen. Dahinwärts sind zwei Stationen, chinesische Ortung.... Die nächsten 20 Tagereisen gehen durch Bergland und Ebenen, ohne

¹ Entwurf zu einer Karte vom ganzen Gebirgssysteme des Himalaja nach den Quellenangaben. Eine Abhandlung in der Königl. Akademie der Wissenschaften vorgelegt 1828. Berlin 1832, p. 5 and 7.

² Journ. Asiat. Soc. of Bengal. Calcutta 1835. Vol. IV, p. 657 et seq., according to Ritter.

³ Asien, V, p. 470.

Bewohner.... Doch sollen diese Ortungs leicht zu umgehen seyn. Von Ladakh nach Kaschmir sind 25 Kafilä Tage, in Eilmärschen um 15 Tagemärsche; es geht über viele Flüsse und Wald; überall ist Fourage für die Lastthiere.

In preceding volumes of this work I have discussed two important maps of Ritter and his assistants.¹ In this connection we have to return to them once more.² The first one to consider is the beautiful map reproduced as Pl. XII in Vol. III.³ Here the Kwen-lun System runs through the whole of Central Asia far into the country of Koko-nor. It has a series of different names. In the west it is in connection with the Bolor Range. Farther east it is called Ni-kung-i-Schan, with the sources of Kara-tasch and Jurong-tasch. Then it splits up into different more or less parallel ranges, the northern of which is Küenlün itself, also called Kulkun or Oneuta, and, south of Chas-sö, Bain-Khara Geb. and, still farther east, Namtsi-tu Gebirg which, finally, is in connection with the classical Chinese Küenlün or Kulkun. RICHTHOFEN shows that RITTER in his first volume of *Asien* only regarded this eastern part of the system as the real Küenlün, but already in his second volume had adopted the view of HUMBOLDT.⁴ From this principal range several other ranges start to the S. E. and E. S. E. The first of them is the Kara-korum which takes its beginning from the Bolor. The second is the Baltū-Glätscher Range. Then follow two or three nameless ranges until we approach Kiria where the great range Khor, with D'ANVILLE'S Mount Kirian stretches to the S. E. the whole way down to Buca-noor north of Tengri-nor. Before reaching so far it divides itself into two branches, the northern of which stretches E. N. E. and is nearly parallel to the Kwen-lun. With the latter its eastern part, Gurban-borodzi-Oola again comes into contact.⁵

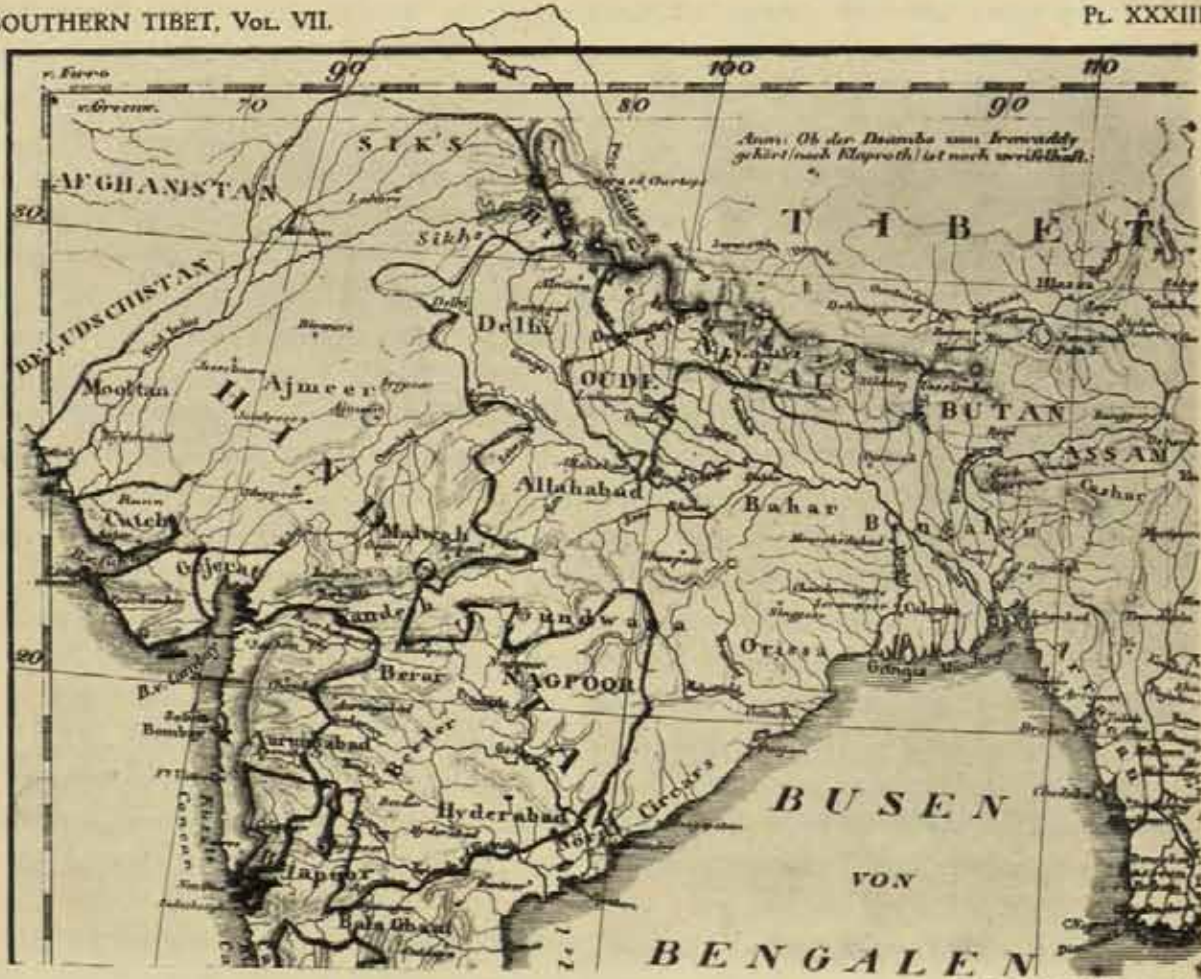
¹ Vol. II, Pl. VI, and Vol. III, Pl. XII.

² Just before the appearance of Ritter's maps, the Himalaya was represented as on the little map, Pl. XXXIII. *Ost-Indien mit den Inseln*. Gest. von L. Thiel. (Gotha) 1831. 38×29 cm, 1:18 500 000. It has the Callas B. (Kailas) as a range along the Upper Satlej, between this river and the Indus. South of it is the Himaleh Gebirge. Klaproth's theory regarding the course of the Tsangpo is touched upon in an observandum: »Ob der Dsambo zum Irawaddy gehört (nach Klaproth) ist noch zweifelhaft.« On other maps, several years earlier, we have seen that the orography was much better sketched than on Pl. XXXIII.

³ The title of this map is: *Karte von Hoch-Asien zu Ritter's Erdkunde*, Buch I, *Asien*, Th. 1 & 2. Bearbeitet von J. L. Grimm, Herausgegeben von C. Ritter und F. A. O'Etzel. Berlin 1832 (Massst. c. 1:6 400 000). (Aus Ritter u. O'Etzel: *Atlas von Asien*.)

⁴ Der vollkommene Wechsel der Anschauungen durch Humboldt's grossartige Auffassung gibt sich deutlich bei Carl Ritter zu erkennen. In dem im Jahr 1832 erschienenen, wahrscheinlich aber einige Jahre früher geschriebenen 1:sten Band seines *Asien* fasst er den Kwen-lun noch in der engsten Weise als einen mächtigen Gebirgsstock in der Gegend der Quellgebiete des Yang-tse und des Hwang-ho, während er schon in dem, 1833 veröffentlichten, 2:ten Band sich ganz der Humboldt'schen Auffassung anschliesst, welche sofort einen viel weiteren Gesichtskreis öffnet. — *China*, I, p. 227, note.

⁵ This arrangement to a certain degree resembles the conception of Dr. GEORG WEGENER on his map, *Übersicht des Kwen-lun Gebirges*, though there the ramifications stretching E. S. E. only begin in the region south of Keria. — *Versuch einer Orographie des Kwen-lun*. Marburg 1891.



Ost-Indien mit den Inseln. Gest. von L. Thiel 1831.

Returning to the west we find that Ritter has a quite correct feeling of the existence of several parallel Kara-korum Ranges. In this respect his conception of the great orographical laws prevailing in these regions is even more correct than that of KLAPROTH four years later (Pl. XXVII). Ritter's principal Kara-korum Range, the one farthest south and accompanying the Upper Indus, carries the name Gebirg Karakorum the whole way down to Ghang-tis-ri. Here Ritter had a deeper understanding of the Kara-korum, as an orographical system, than the geographers who in 1909 called the part of the system that is crossed by the Leh-Yarkand road, the Eastern Kara-korum instead of the Western. The name, Padischa Gebirg, which is a mistake as shown above, is also entered on the map.

The most interesting fact is, however, that Ritter's Kara-korum may be said to continue all the way to Amdo and the upper course of the Yangtse-kiang. It would, however, be more correct to say that it joins the »Kailas Gebirg» as the part of it which he calls Ghang-tis-ri and which is only a Tibetan form of Kailas. After this junction the range turns straight east, north of the Tsangpo, and is called »Tibetisches Gebirg», and, farther east, Gang-dis-ri. South of Tengri-nor it is called Nian-tsin-tang-la Gangri, and then Gatsian and then Samtangandza or Dzang Gebirg. Here is the Transhimalaya as it was believed to be 25 years before the fantastic construction of HODGSON (Vol. III, Pl. XV), and as it was built up from the scanty and unreliable oriental information existing. The map shows, at any rate, that Ritter suspected a certain intimate relationship between the Kara-korum System in the west and the Nien-chen-tang-la System, south of Tengri-nor, and here he penetrated the truth even more ingeniously than Klaproth and Humboldt.

Ritter has entered the great caravan road from Leh to Kargalik. His stations are: Sibü, Aschkam, Tschorak-dschangal, Tschung-ulang, Yartobi, Kotak-lak, drawn as an eastern tributary to the Shayok, Tsung-tasch, Chamden, Yaptsan, ein Haltplatz (a resting place), Karákorum, Karákorum P. (Pass) which is situated in the Külenlün Range, Sarag-ot, Tagtek, Aighar-saldi, Bagh-Hadschi-Mohamed, Yartuk, Kulan, Yagnidabahn, Misar, Tsakilak, Chelasten, and Ak-meschi. The Shayok River has its source on the southern side of the Kara-korum Pass, and the Yarkand River on the northern side. To the west of the Upper Yarkand River is the range Tsung-ling. In the vicinity of Tsung-tasch and Chamden, *i. e.* Chong-tash and Kumdan, the road leaves to its left or in the west, the mighty range called Baltü-Glätscher, that is the High Kara-korum with the gigantic glaciers of Baltistan. This range has no southeastern continuation. N. E. of it follows a smaller range which comes in between the High Kara-korum and the Külenlün or Kwen-lun. The latter, with the Kara-korum Pass, really makes the impression of being a bulwark of Eastern Turkestan to the south, for the mountains north of it, in the direction of Yarkand, are comparatively insignificant.

The tiny little map which is merely used as a decoration or frontispiece on the title page of Ritter's learned essay of 1828,¹ here reproduced as Pl. XXXIV, is, in spite of its small scale, of very great interest, and from some points of view still more surprising than the map just discussed (Pl. XII of Vol. III). Here the great features, the orographical skeleton of Tibet, are very correctly represented. The mighty protuberance north of India which he calls Hoch-Asien or High Asia, is bordered by the Himalaya to the south, and the Kuen-lün to the north. South of the latter, and bounded to the south by the upper courses of the Indus and the Tsangpo, we find two mountain ranges of the same length as the Himalaya and the Kwen-lun and parallel to them. Only two names are entered upon these ranges, Bolor in the far west of the northern one, and Tibet Gebirg in the eastern half of the southern, whilst the Kailas is a short independent range north of the Manasarovar. These two ranges may indeed be said to represent the Kara-korum System and its eastern continuation. Disregarding the fact that the Kwen-lun turns to the N. E., which makes Eastern Tibet much broader, this little map may be said to be more like reality than maps published some 40 years later.

One year later, or 1833, RITTER published the map, drawn by J. L. GRIMM, and partly reproduced here as Pl. XXXV.² The object of the reproduction is only to show how Ritter, in 1833, imagined the S. E. continuation of the Kara-korum. To the right or N. E. of the joint Indus and the Singzing-Kampa or Singi-kamba he has his Kara-korum Gebirg drawn as a mighty range. This divides into two branches, the eastern of which still follows the right side of the Singi-kamba, whilst the western, which is pierced by the river, developes into the famous Cailas or Kylas north of Manasarovar.

I have found it superfluous to reproduce here C. RITTER'S and F. A. O'ETZEL'S map of the Interior of Asia in four sheets, published in 1840.³ Here we recognize some of the principal features of the map Pl. XII in Vol. III, though the map now in question is on a larger scale, and is very rich in detail. In the west we find the Thsunling in intimate connection with the Puschtikur. To the north of these mountains we find some of the names of Goës, such as Sacrithma, Sarcil or Sere kul and Ciecialith or Tchicheklagh. The Pass Kara-korum is still shown as belonging to the

¹ *Entwurf zu einer Karte, etc.* Read in the Roy. Acad. of Science in 1828, published at Berlin 1832.

² Its complete title is: *Das Himdlaja Gebirg in Bissahir, Gherwal & Kemaun, vom Südrande des Plateaus von Mittel-Tibet bis zum Tieflande von Hindostan.* Mit besonderer Rücksicht auf Carl Ritter's Allgemeine Erdkunde, II. Buch, Th. 2, S. 493, auch S. 660 ff. entworfen und bearbeitet von J. L. Grimm, herausgegeben von C. Ritter und F. A. O'Etzel. Berlin 1833.

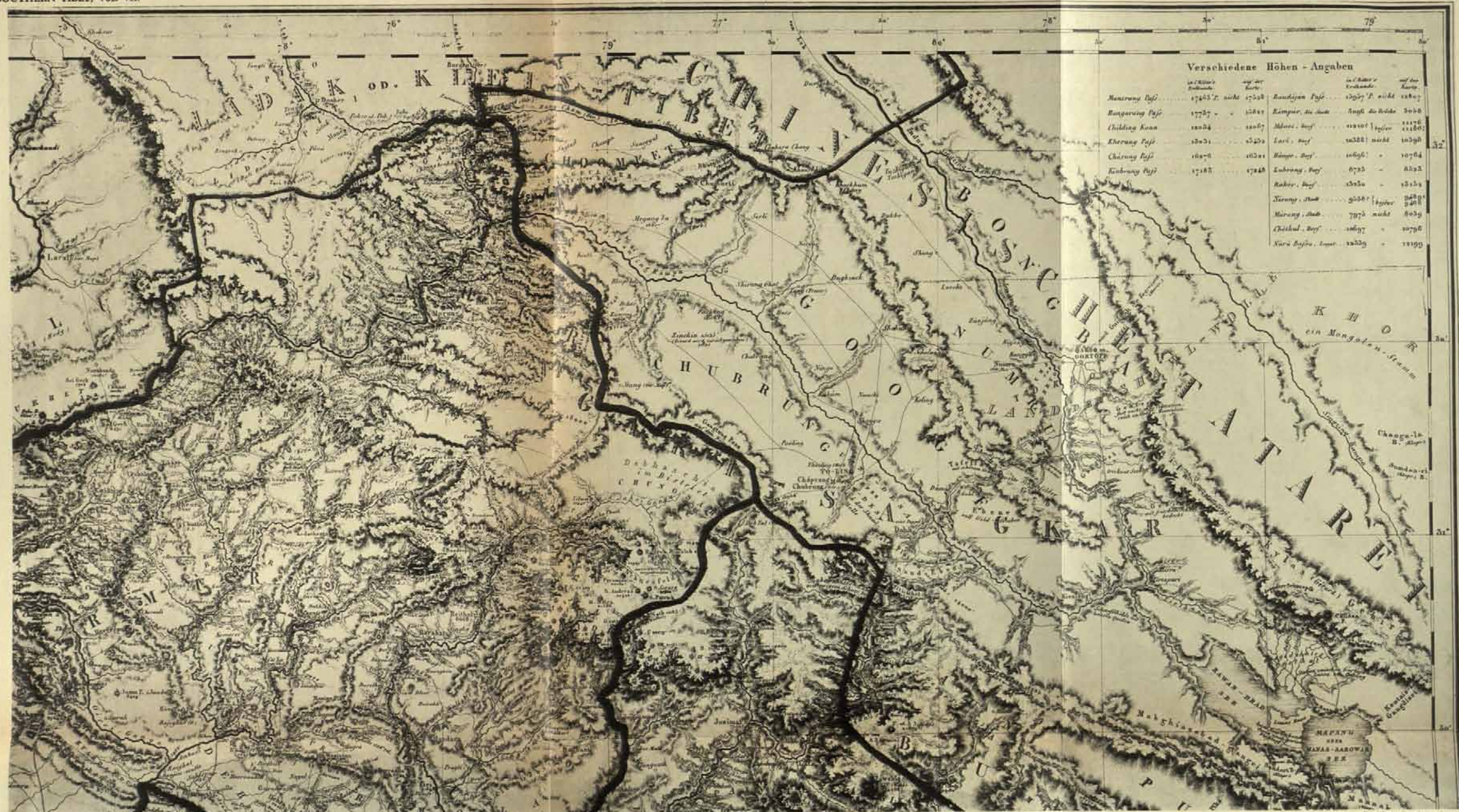
³ Its title is: *Karte Inner-Asiens zu C. Ritter's Erdkunde.* Buch 3. Übergang von Ost nach West Asien bearbeitet von Carl Zimmermann . . . herausgegeben durch C. Ritter und F. A. O'Etzel. Berlin 1840. This map is in four sheets, published together with a general orographical sheet under the title: *Atlas von Vorder-Asien in V Blättern.* Berlin 1841.

Eine Abhandlung in der Königl. Akademie der Wissenschaften vorgelegt 1828.



Berlin.

Frontispiece to Entwurf zu einer Karte vom ganzen Gebirgssysteme
des Himálaja von C. Ritter. Berlin 1832.



J. L. Grimm, C. Ritter and F. A. O'Etzel, Berlin 1833.

Kuenlun, and so is Sherefeddin's Carangutac. Baltu Gletscher is a range to the north of and parallel with Karakorum *oder* Padischa, the latter running along the lower course of the Shayok, and touching the northern end of Panggong-tso. In 1840 and 1841 no other map could be compared with this in completeness.

The general map accompanying the same publication is of interest. With black lines it shows the principal stretchings of the mountain ranges. In the west is Bolortagh and the ranges west of it stretching N. N. W.—S. S. E. The Kuenlun, Baltü Gletscher and Karakorum stretch N. W.—S. E., parallel to the western Himalaya. In light tones some profiles are placed on the map showing profile sections of the different ranges.

I cannot finish this chapter in any better way than by quoting the following passage of Ritter regarding the relations between the Ts'ung-ling, Kara-korum, Kailas and Nien-chen-tang-la.¹ He regards the Kailas as the mountain knot from which ranges start in different directions:

Dieser Kaylasa, oder Kailas der Hindus, der Chinesische Oneuta, oder O-neou-ta ist der Tübetanische Gang-dis-ri, d. h. Schneefarbiger Berg, daraus auf D'Anville's Karten Kentaisse. Von diesem Gebirgsstock ziehen sich in nordwestlicher Richtung, also nördlich von Ladak, gegen den Thsung-ling hin, die Kette Karakorum-Padischah, gegen Ost die Schneeketten Hor (Khor) und Dzang. Jene, die nördliche, die Hor-Kette, schliesst sich mit ihrem N. W. Ende an den Kuenlun an, und läuft gegen Ost dem See Tengri Nor zu; diese, die Dzang-Kette, weit südlicher als jene, begrenzt das lange Nordufer des Dzsangbo-oder Thsambu-Tales, giebt gegen Norden dem Tarku Dzsangbo, der in den Tengri Nor fällt, seine Quellen, und läuft von W. gegen O. der ungemein hohen Gletschergruppe Nien-tsin-tangla-gangri der Tübeter zu, die zwischen H'lassa und dem Tengri Nor einen merkwürdigen Grenzstein bildet.

These words, which are in perfect accordance with the map, Pl. XII of Vol. III, hit the very mark of the problem. Before my journey in 1906—1908 in the mountain system of the Transhimalaya, not a single geographer has been so near real facts as KLAPROTH and RITTER. The chief object of this volume is also to prove that the Ts'ung-ling (partly), the Kara-korum, the Mus-tag, the Kailas, and the Nien-chen-tang-la, are one and the same great system of folds, or, in other words, that the Transhimalaya is the eastern continuation of a part of the Kara-korum System.

¹ Partly quoted also in Vol. III, P. 83, in connection with the Transhimalaya.

CHAPTER XXI.

BURNES, HÜGEL, VIGNE.

The three travellers whose names are read in the heading of this chapter have all more or less contributed to a better knowledge of the Kara-korum System, though most of what they have to say is only founded on second hand information.

Sir ALEXANDER BURNES, whose discoveries were very welcome to RITTER'S *Asia*, travelled in 1832 in the vicinity of our regions.¹ In a very clever way he compared his own observations with those of MOORCROFT, MIR IZZET ULLAH and ELPHINSTONE, and contributes to improve MACARTNEY'S map. The Shayok River he does not know from personal experience, but says: »The Shyook is said to be a vast river, formed of many small ones, and discharges the water and melted snows of the Karakorum mountains.»² And further: »The river of Ladak, and the Shyook, instead of existing as two minor tributaries of the Indus, form of themselves that great river; the one rising near the lake of Mansurour, and the other in the mountains of Karakorum. They unite N. W. of Ladak, and pass through the country of Little Tibet, or Baltee, and a snowy range separates them from Cashmere.»³ As to the river of Kabul, he thinks it has its sources in the same neighbourhood as the Oxus; »but that river flows from the plain of Pamere, near Lake Sirikol, and not from the ranges of mountains which support that elevated region.» He brings order into the confusion regarding the two Cashgars, proving that the southern one, mentioned by Elphinstone, is only a small mountainous district. Here he quotes KLAPROTH'S *Mémoires relatifs à l'Asie*, II, p. 298, and is satisfied to find his own observations »on the two Cashgars confirmed by so high an authority as M. Klaproth».

Later on in his narrative Burnes again returns to the source of the Oxus, and makes the following rather surprising utterance: »It is stated that four rivers, which flow in opposite directions, issue from the vicinity of the lake Surikol: these

¹ *Cp.* Vol. II, p. 63 above.

² *Travels into Bokhara, etc.* New Edition, Vol. I. London MDCCCXXXIX; p. 272

³ *Op. cit.*, p. 270.

are the Oxus, Sir or Jaxartes, one of the heads of the Indus, and a portion of the waters of Tibet.»¹ The same information, *viz.* that the Indus has one of its sources, nay the principal source west of Kashgar, had been given to CHERNICHEFF. How any one of the rivers of Tibet could have its source in the vicinity of Lake Sarikol is difficult to see, even if the name Tibet signifies Ladak, as is obviously the case. That Burnes could find this information likely at all seems to indicate that he did not quite understand the importance of the Kara-korum System. RITTER did not believe in such marvellous tales. At another place Burnes, however, drops the story about the Tibetan waters coming from the Pamir: »The high plain of Pamere lies between Budukhshan and Yarkund.... The centre of this table-land is the lake of Surikool, from which the Jaxartes, the Oxus, and a branch of the Indus are said to rise.»² On the map accompanying his work there is nothing that could permit such a conclusion. Nor is the following passage in accordance with the map: »The tract that lies beyond the Beloot mountains and Budukhshan, and between it and Cashmere, is filled up by the cantons of Chitral, Gilgit, and Iskardo.»³ There is a river Bolor and a place Bolor on the map, but no mountains of that name.

The following bit of information collected by Burnes proves to be much more reliable than some of those quoted above, and contains a rather good description of the difficulties of the Kara-korum road.

I had a most interesting account of the country lying between Yarkund and Ladak, in Tibet —, from a native who had travelled there, and which will convey any but favourable notions of this channel of commerce, frequented, as it appears partially to be. The traveller set out from Ladak in March, and reached Yarkund in sixty days, after encountering a series of disasters and difficulties from a storm that arose in passing the mountains of Kara Korum. The number of actual marches does not exceed 28, but seven whole days were occupied in crossing Kara Korum, which is described as a low ridge at the eighth march . . . — Though Kara Korum is not a high range of mountains it must be elevated, since a difficulty of breathing was experienced . . . —

Inhabited country was reached on the 18 day from Ladak.

At the seventeenth march the travellers entered a defilé among hills which extended for five or six miles, and is called Yengi Dabban. The road led entirely over ice, which was notched into steps before they could proceed. On returning to Ladak in June, the ice had altogether disappeared: even Kara Korum was free from snow. This is singular, as it must be higher than Hindoo Koosh, which is covered by eternal snow. To the south of Kara Korum all the rivers join the Shyook; and it is evident, therefore, that that ridge, low as it actually appears, is the highest part of the range. North of it the water flows into the river of Yarkund . . . The number of horses which perish on this line of route is great; and it is not an unusual thing for an owner to pick up his goods next year on the spot where they were left.

¹ Op. cit., Vol. III, p. 161.

² Op. cit., Vol. III, p. 180.

³ *Ibidem* p. 181.

On his map¹ Burnes has *one* great range in the south: Himalaya, Indian Caucasus and Hindoo Koosh; and north of it Kara-korum Ms. form a very inconsiderable convexity. The name Kara-korum Ms. is entered only at the place where the Kara-korum Pass is situated. The rest of the enormous system, which on RITTER'S map of 1832, the same year as Burnes travelled, presents itself as two mighty ranges and a third smaller one, is here shown as very insignificant hills. Burnes is aware of the fact that all rivers south of the Kara-korum join the Shayok, and it is, therefore, the more surprising that he could believe in the assertion that the Indus had one of its sources near the Sarikol Lake.

On his map, *Central Asia*, 1834, JOHN ARROWSMITH has, south of Yarkand, a range called Yagni Dawan or New Mn. which in reality corresponds to a part of the Kwen-lun (*Vide* Pl. XXXVII). South of and parallel with this range he has Tsoung-ling or Kara-korum Ms., drawn as a rather mighty mountain system. Farther south the whole way to the Upper Indus and Leh he has only insignificant, detached hills.

The map of JAMES WYLD, 1839, *Map of the Countries lying between Turkey & Birmah, etc.*, of which Pl. XXXVIII shows a part, is in no small degree influenced by J. Arrowsmith. We again find the Yagni Dowan (*sic!*) or New Ms. and the Tsoung-ling or Kara-korum Ms. The eastern continuation of his Yagni Dawan is called M. Karangoui, M. Echimetis and Oncuta Mts. This long system of mountains represents the Kwen-lun. His Kara-korum, on the other hand, comes to an end in the region of the sources of the Shayok, south-east of which he has entered the word Desert. Therefore, according to Wyld, the whole country east of the Shayok and Leh consists in a very extended plateau-land desert, at any rate reaching so far as to the Ike-namur-nor and Bagha-namur-nor, of his map.

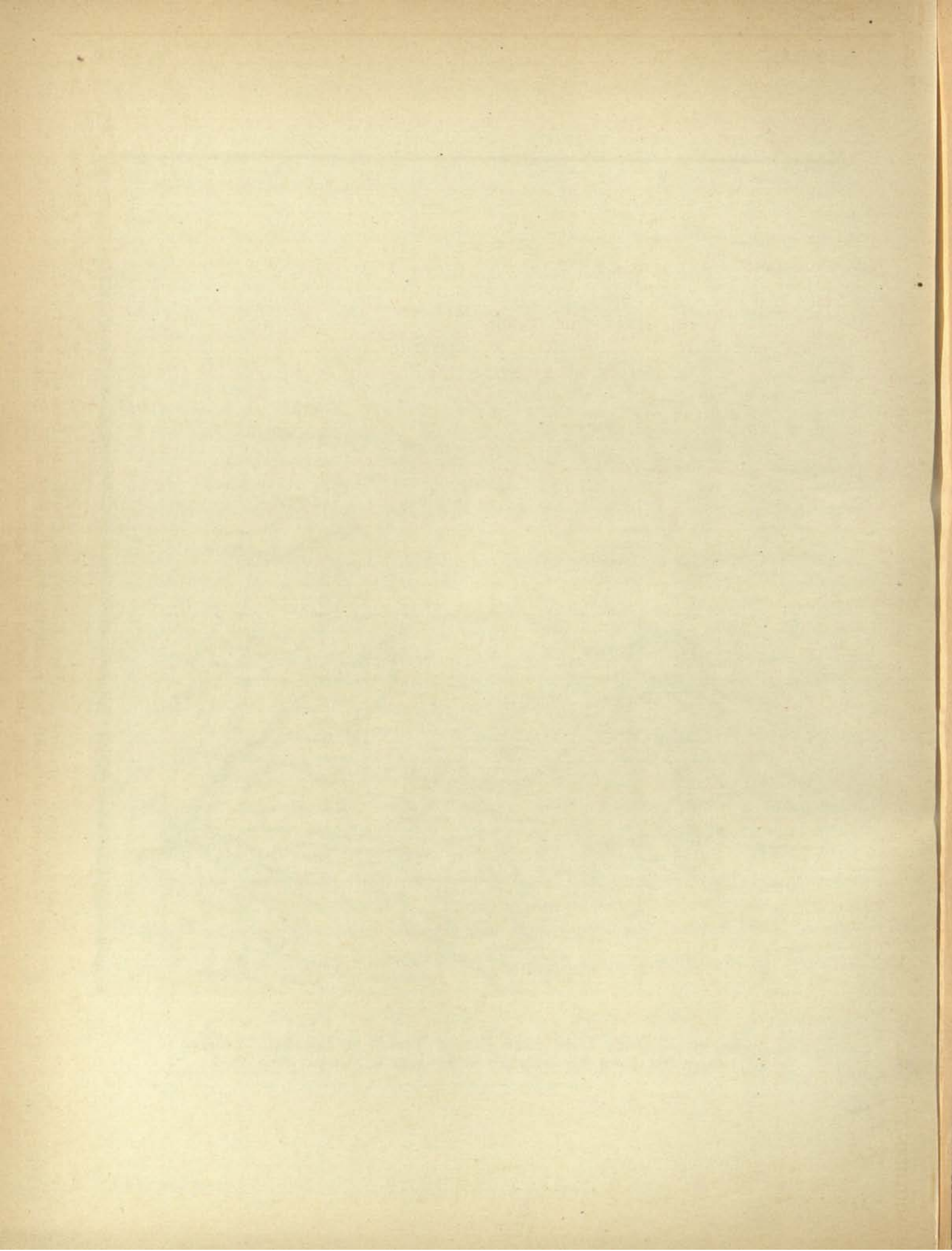
WOOD'S journey in 1838 does not fall within the limits of Kara-korum proper. In his general view of the mountains he does not ever mention this system. He says:

„In speaking of the Hindú Kosh range of mountains in contradistinction to the Himalaya, it may be well to define both chains. The latter, as is well known, bounds Hindustan on the north, and after crossing the river Indus extends westward to the valley of Panchshir and the meridian of Kabul. The other chain I have before described. They are connected by numerous lateral ridges, and evidently belong to the same great system of the Himalayan-Tartaric mountains, which extend both to the east and west beyond the limits to which any experience reaches. Hindú Kosh is their northern wall, Himalaya is the southern one. The former, however, would appear to

¹ *Map to Illustrate Lieut. Alex. Burnes' Travels to Bokhara; Reduced from Mr. John Arrowsmith's larger map of Central Asia, 1835.* — Partly reproduced here as Pl. XXXVI. The map of J. Arrowsmith has the title: *Central Asia comprising Bokhara, Cabool, etc. Constructed from numerous authentic documents, but principally from the original M. S. Surveys of Lieut. Alex. Burnes by J. Arrowsmith, 1834.* — Pl. XXXVII shows a part of this excellent map.

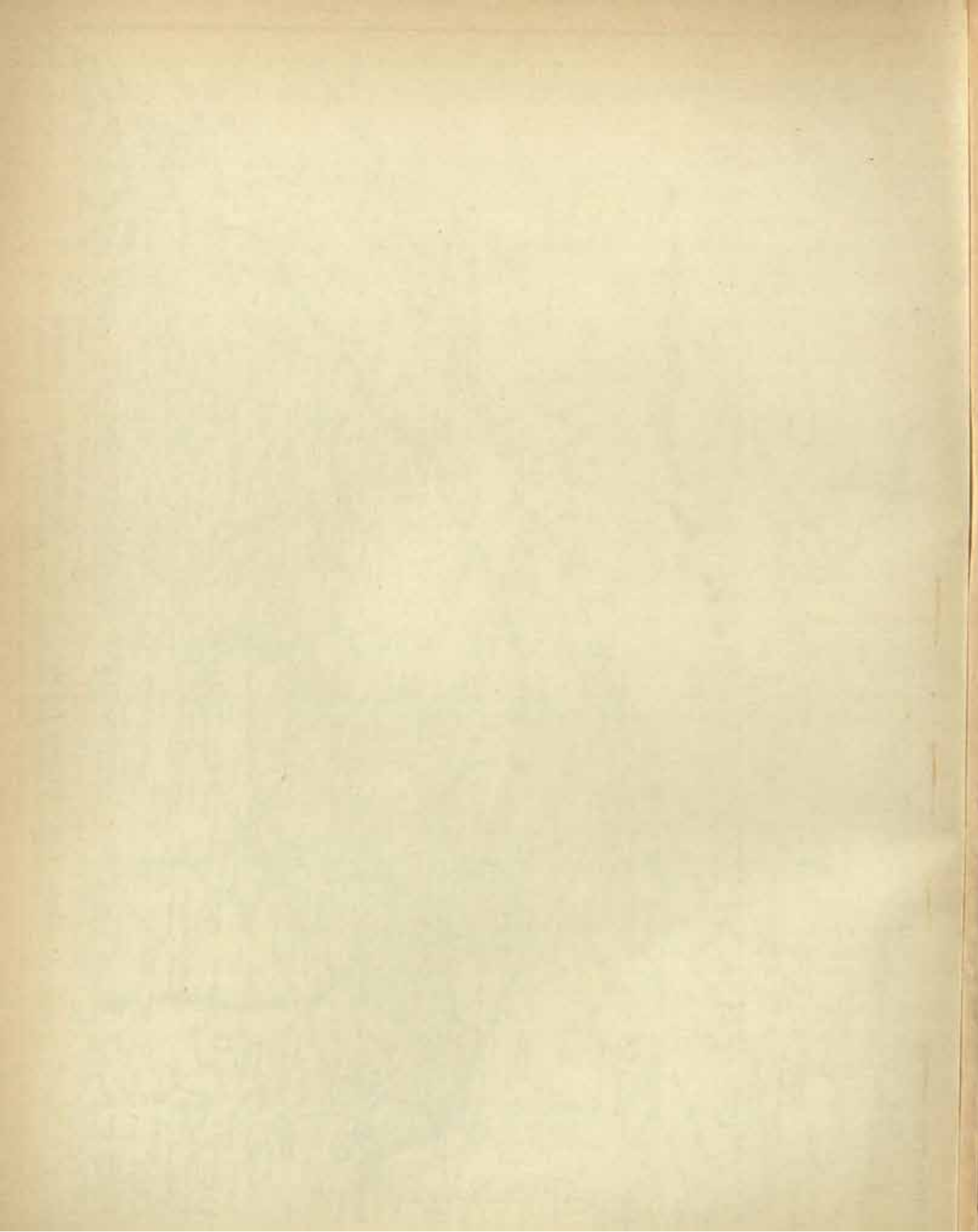


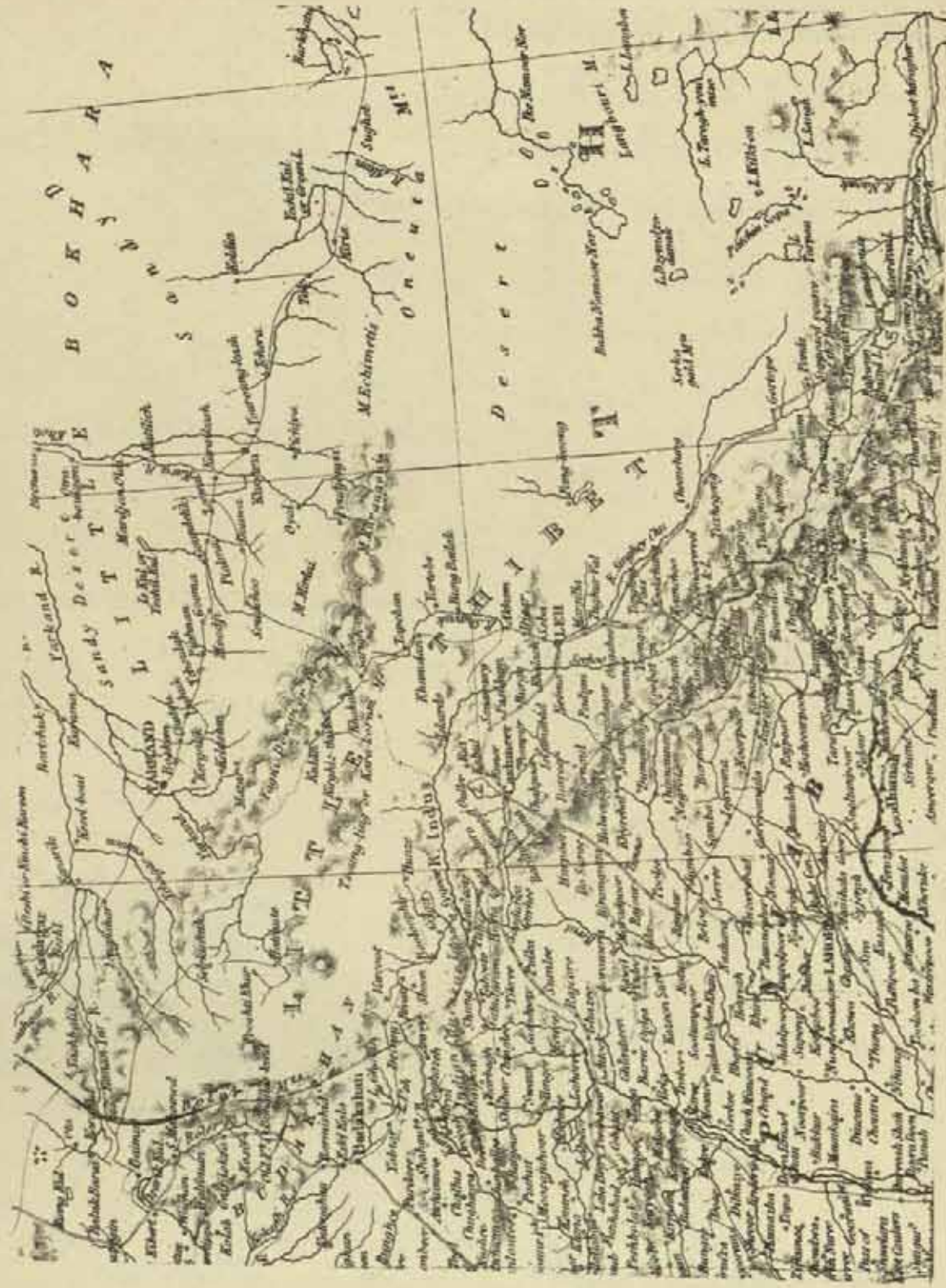
Map to Illustrate Lieut. Alex. Burnes' Travels to Bokhara. Reduced from Mr. John Arrowsmith's larger map of Central Asia 1835.



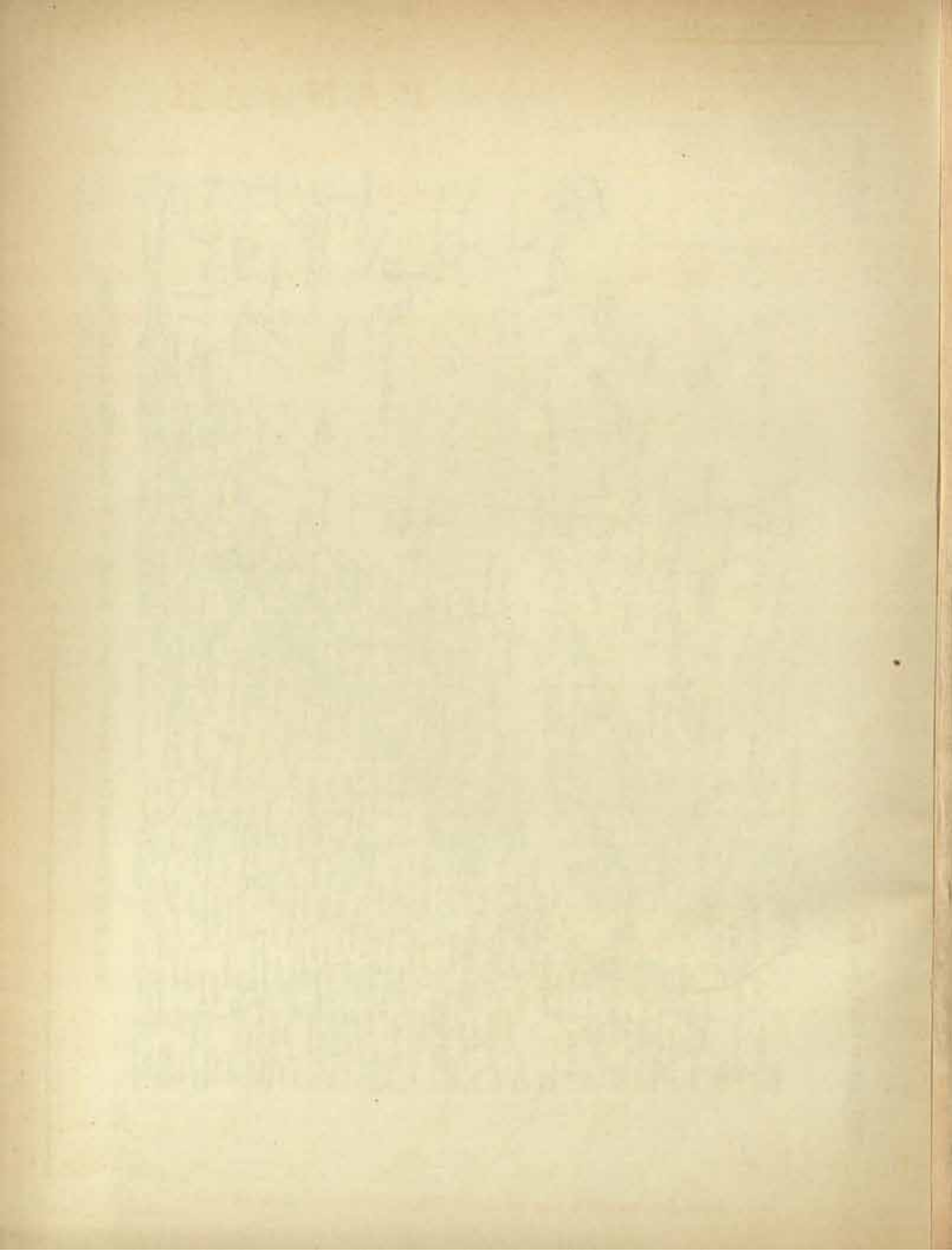


Central Asia comprising Bokhara, Cabool, etc. Constructed from numerous authentic documents, but principally from the original M. S. Surveys of Lieut. Alex. Burnes by J. Arrowsmith. 1834





Map of the Countries lying between Turkey, Birmah, etc. By James Wyld, London 1839.



MAP OF THE
PANJÁB,
KASHMIR, ISKARDU, & LADHAK;
COMPRISING THE DOMINIONS OF
RANJEET SINGH.

Compiled from Original Documents.

Particularly from the Detailed M.S. Map of

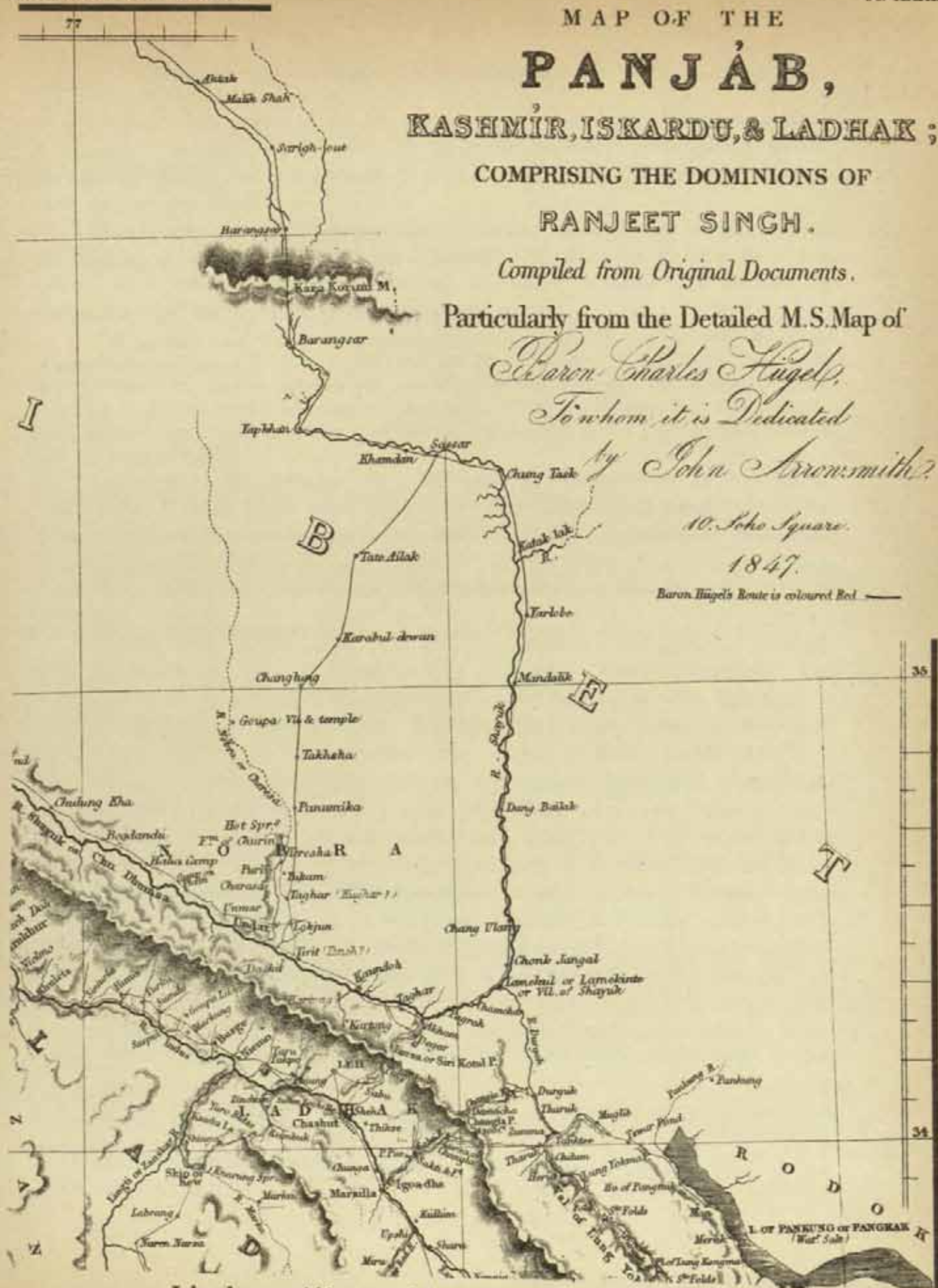
Baron Charles Hügel,
To whom it is Dedicated

By John Armstrong?

10. Loko Square.

1847.

Baron Hügel's Route is coloured Red —



John Arrowsmith's map of Baron Hügel's Journey. London 1847.

Y. A. N. A. M.

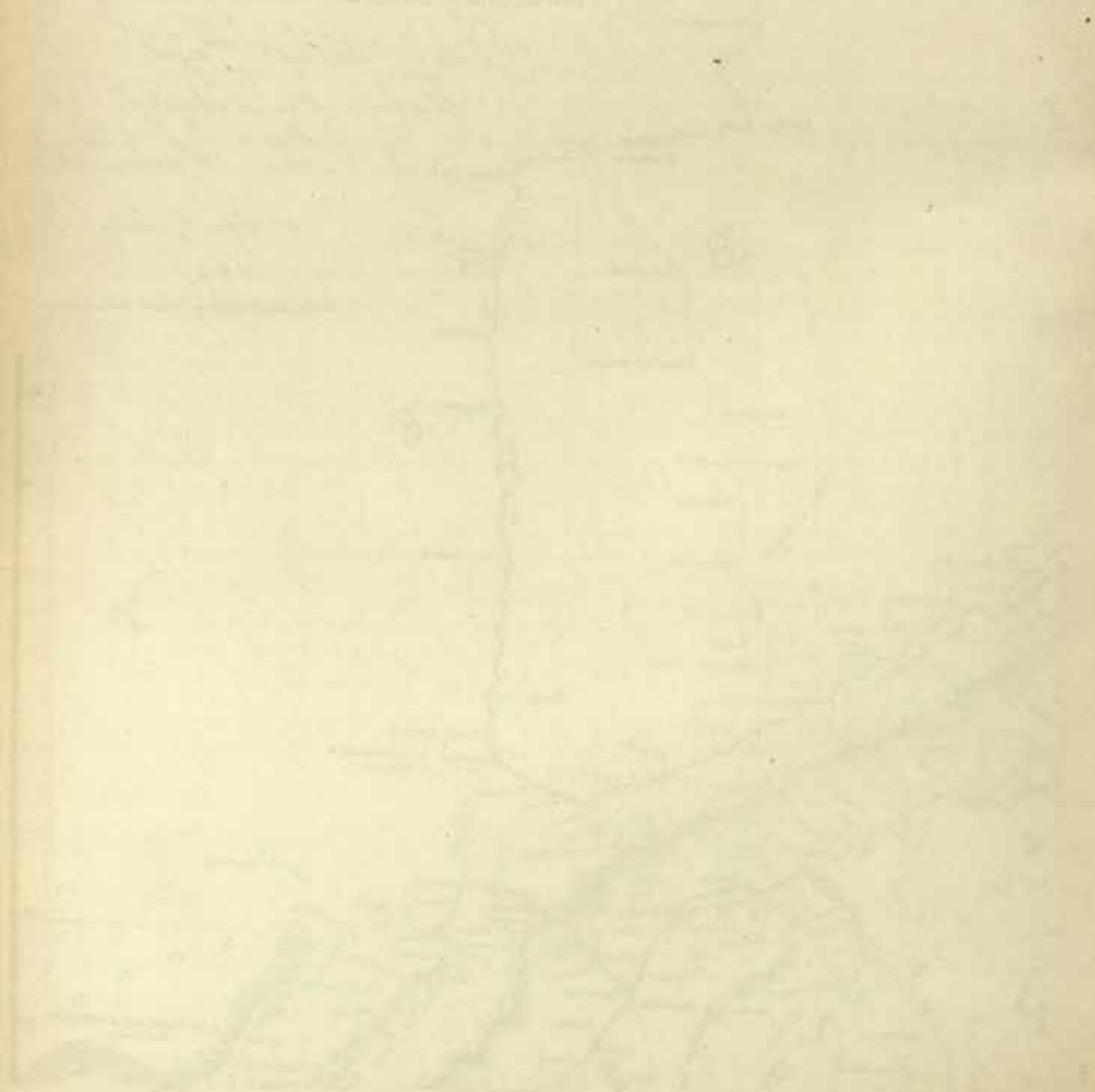
Y. A. N. A. M. - Y. A. N. A. M.

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be the superior ridge, since it divides the waters of Central Asia from those which flow south. It is one continuous chain; while, on the contrary, the Himalaya is pierced by both the Kuner and Indus rivers; and no stream that has its rise in this range runs towards the north.»¹

Baron CARL VON HÜGEL never went so far east as Ladak, nor did he approach the Kara-korum System at all, so the information he was able to bring back was indeed very poor. He himself regards the road between Ladak and Yarkand as leading through nearly perfectly unknown regions:

Von Ladhak nach Yarkand werden 40 Tage Wegs durch fast gänzlich unbebaute Gegenden angenommen. — Iskardu hat nur mit Kaschmir und Ladhak Verbindung, und obgleich es heisst, dass es möglich sei, seinen Weg von Iskardu nach Turkestan durch Kaschgar und Badakschan zu finden, so wird dennoch von den wenigen Reisenden, welche ein Geschäft dahin führt, entweder jener über Kaschmir und Kabul, oder der über Ladhak und Yarkand gewählt.²

Later on in his narrative Hügel discusses the possibility of an invasion of India by the Yarkand Ladak road: Dass eine Armee diesen Weg durch unbewohnte Wüsten nicht nehmen werde, um Indien anzugreifen, ist augenscheinlich, und einem kleinen Korps würden weder die Chinesen den Durchzug erlauben, noch ihre Erscheinung in Kaschmir von irgend einem Nutzen seyn, wo dasselbe auf sich selbst beschränkt wäre.³

To the second part of Vol. IV of Hügel's work which was published in 1848, John Arrowsmith has drawn a map containing the Bavarian Baron's itineraries.⁴ The Kara-korum road is entered with all its stations, and between the two Barangsar is a rather mighty range Kara-korum M. The rest of the system is not at all entered on the map (*Vide* Pl. XXXIX), and the country north of Skardu is left blank.

In G. T. VIGNE'S narrative we find the first autoptic descriptions of the Kara-korum Mountains, so far as he came in contact with them on his remarkable journey.⁵ He visited our region in 1835, and travelled with open eyes. Only at the end of the second volume of his work we reach those parts of Western Tibet and Kara-korum which interest us here. He characterizes it as a country of immense peaks visible from every elevated pass; in this respect Western Tibet differs somewhat with the easterly parts of the Himalaya, where the country is covered by long connected ridges, and where, with the exception of Nepal, there is no table-land on the southern face.

¹ *A Journey to the Source of the River Oxus*. New Edition, London 1872, p. 240.

² *Kashmir und das Reich der Sikk von Carl Freiherrn von Hügel*. Zweiter Band. Stuttgart 1840, p. 200.

³ *Op. cit.*, p. 473.

⁴ *Map of the Punjab, Kashmir, Iskardu, & Ladhak . . . Compiled from Original Documents, particularly from the Detailed M.S. Map of Baron Charles Hügel, to whom it is Dedicated by John Arrowsmith*, 1847.

⁵ *Travels in Kashmir, Ladak, Iskardo etc.* Vol. II. London 1844, p. 248 *et seq.*

He divides Tibet into Upper, Middle and Little Tibet, extending east and west between Lhasa and Gilgit.

From Skardo he crossed the Indus and entered the Shighur, travelling up the valley and crossing the Shighur on rafts. Here he made the following observations.¹ »Two long valleys join the waters of their respective streams at the head of the valley of Shighur, of which that on the left, as we ascend, is merely a continuation, and is called Basha. That on the right is Brahaldo, and is continued to the foot of the Muztak, which is reached on foot in about eight or ten days.» He marched only a short distance in it, but was informed by Dr. FALCONER that he ascended it for several days, in the hope of reaching the foot of the Muztak, »but finding the distance and difficulty far greater than he had expected, he returned, across a steep mountain-pass, to the castle of Shighur».

He got some interesting information about the old Mus-tagh road to Yarkand: »The path down the Muztak is one of the best ways to Yarkand, and was formerly much used by saudagurs, or merchants, in their journeys, to and from Kashmir.» Russian merchants were said formerly to arrive at Kashmir, after passing up the valley of the Oxus, »whence they must either have crossed the Plain of Pamir and joined the regular road via Yarkund and Ladak, or that by the Muztak and Iskardo, or have crossed the Mustoj pass, from Issar, and arrived at Kashmir via Chitral, Gilgit, Husára, and Gurys; which latter is by far the most probable, as it is the nearest road for them».

Vigne also brought back the first reliable knowledge of the great Kara-korum glaciers: »the glory of the valley is the magnificent glacier at the end of it. Its lower extremity is a short distance from the village of Arindo, and the natives say that it is slowly but perceptibly advancing. It occupies the entire valley as far as the eye can reach.... The width of the lofty wall of ice, in which it terminates towards Arindo, is about a quarter of a mile.» He was surprised to see not a brook but a great river emerging from beneath the glacier, and he could not explain this great quantity of water in any other way than »that a lake or reservoir must exist at its upper extremity».

Not far from the foot of the glacier was a defile »and on the summit of the defile is another glacier, over which, with two or three days scrambling, and being fastened together by ropes, there is a way to the valley of Nagyr». He meditated an excursion over the Muztak to Nagar, Pamir and Kokan, but want of time prevented him from carrying out this plan. He heard, however, that with kulis it should take 8 days to reach the plains of Pamir, from which he believed Badakshan could be reached in 10 days and Yarkand in less time, *via* the Sir-i-Kol.

¹ Op. cit., p. 283.

He had also the intention of visiting the Nubra-tso, »the lake under the Kurukurum mountains», whence the Shayok was supposed to take its rise. He knows the range of mountains, »more than 16,000 feet in height, behind Leh, which divide the valley of the Shy-Yok, or Nubra River, from that of Ladakh, the nearest distance between them, from Ladakh, being about 20 miles, in a direct line».

Vigne characterises Leh as the well known *rendez-vous* for merchants to and from Yarkand. But he has also heard of another road by the plains of »Chang Thung», to the north of Ladakh, although closed by the jealous Chinese. He believes that these plains commence but a few days march from Leh. »The only inhabitants are wandering shepherds, who range with their flocks and their families over an almost boundless extent. The elevation of these plains must be very great, probably between 13 and 14,000 feet.» The peaks rising from these plains are generally covered with snow, and the cold is intense.

Gulab Sing was annoyed at Vigne's visit to Little Tibet, and now as Vigne was at Leh, Gulab Sing feared that the traveller intended to explore the road to Yarkand. Not without difficulty he obtained permission to visit Nubra under condition that he should not proceed any farther. There were two alternative roads over the mountains behind Leh. The road he took went first east and then north over a pass 16,000 feet high and situated in »dark-coloured trap». Then he came in view of mountain masses and tops in every direction and chiefly on the other side of Shayok or the river from Nubra-tso. »Amongst those on the north, the snowy sierra of the Muztak, extending from Hunzeh to Nubra, arose with conspicuous and most majestic grandeur.» The village Shayok is mentioned as the last inhabited place on the way to Yarkand and he knows that it takes a little more than one month to reach Yarkand. »The road to Yarkand ascends the bed of the river, which is constantly crossed and recrossed by wading; and the mountains or pass of Kurukurum are in this manner reached about the 9th or 10th day from Ladakh.» He correctly says the road to Yarkand crosses two passes, Broknanpah (?) and Sisur (Saser), before it reaches Kara-korum, which he calls a pass or a mountain. »The Kurukurum mountains I believed to be a branch or spur from the Muztak, and the principal crest to be passed in the way from the Shy-Yok to Yarkund.» The word »Kurukurum» he correctly translates The black rocks.

The following passage dealing with the Kumdan glacier is interesting:¹

Both the roads I have mentioned, meet before the last ascent commences, and from the place of junction, the glacier of the Nubra Tsuh is visible on the left, and the incipient Shy-Yok flows from it. The Nubra Tsuh is, as well as I could collect, a head water, formed by a vast barrier of ice, that has dammed up a valley formed between two spurs

¹ *Ibidem* p. 362.

of the Kurukorum. Various and most conflicting were the accounts given of its extent, but all agreed that it was very large.

He believes it was 3 or 4 miles in length and less than 1 mile in width. »Not many years ago, the protecting glacier gave way and the mighty flood, no longer confined, rushed down the valley of the Shy-Yok, destroying every village that came within its reach»

Again Vigne says of the Kara-korum:¹

I have no means of knowing, with any exactness, the height of the Kurukorum mountain above the sea. On its right, say my informants, the country is more open, and slopes away to the plains of Chang Thung, or others; whilst very lofty and snowy mountains, spurs from the Muztak, if not the end of the Muztak itself, are visible on the left hand The snow, so say the Yarkundi merchants, does not remain upon Kurukorum, for the greater part of the year, and they attribute this to the tremendous power of the winds that sweep over it, rather than to the heat of the sun.

Vigne was informed that on the northern side of the Kara-korum a river goes down to Yarkand and receives an eastern tributary from the »Chang thung». He heard that from »Sir-i-Kol» it was about five days to Cheruk-sa, where the way from Brahaldoh meets the Kara-korum road. He says the Muztak way *via* Iskardo is 10 days shorter than the other road.

The river of Kashgar rises on the east side of Tyak Dewan (Terek-davan), and is joined, after passing Kashgar, by the river of Yarkand. Farther east it was said to join the Hwang-ho, a statement which betrays its Chinese origin. Vigne adds: »But information from natives is not much to be depended upon.»

From this trip he returned to Leh by another pass, obviously the Kardung-la. Next year we again find him in Little Tibet intending to proceed to Kokan. There were said to be two roads, one across a shoulder of the Muztak, from the valley of Brahaldoh to Hunza and thence to Pamir, and thence descending upon Kokan from Sir-i-Kol. However, he was not able to realize his plans. Once more he visited Shighur together with Dr. FALCONER. During his stay here an envoy came from Hunza over the Muztak Pass, which proves that this road was still in use in 1836.

About his second journey to the source of the Shayok, Vigne says that he ascended the low ridge behind the village of Ghortsuh near Khopalu on the Nubra River, and »from the summit beheld the valley of Saltoru, containing several villages and a considerable river, which was winding its way to the Indus». The evening of the third day brought him to the last village in the pass. »There was scarcely an interval between the precipices that was not occupied by a magnificent glacier.»

Vigne ascended one of these glaciers which are now so well known and says of it that it has half a mile in width, »but afterwards spreading to a much greater

¹ *Ibidem* p. 363.



John Walker's map from the MSS Surveys of G. T. Vigne, 1842.

extent, and then swelling upwards until it met the horizon, and thereby gradually diminished the elevation of the mountain-tops by which it was bounded». He passed a night on the glacier. »The next two or three nights were to be passed in a similar manner on the ice, and two lofty and difficult ridges were to be crossed upon the way.» The glacier still rose gradually and majestically, seeming to rise in height with the giant peaks on either side of it, and completely hiding all that was beyond it. On account of the late season of the year, our traveller had to return. Thereby he »ascended a defile» leading from the Saltoru valley to the village of »Kor Chondus».

Vigne's map Pl. XL¹ completed by J. Walker in 1842 and taken principally from the MSS surveys of himself, is of considerable interest, as it very clearly and distinctly points out the Kara-korum Mountains. To the east, however, it terminates rather abruptly and in its eastern prolongation is written: »Long open slopes free from snow in summer.» We find a »Pass to Yarkund» *i. e.* the Kara-korum Pass south of which there are the two source branches of the »Shai Yok or Northern branch of the Indus». The eastern source branch comes down from the pass, the other from the »Nubra or Khundun Tsoh Lake,» or, as we should write it: The Kumdan-tso. Where the Kichik Kumdan glacier goes down to the valley we only read the word »Glacier». South of it is »Sisur Hill» or Saser-davan, and two other mountains on the road from Nubra to Kara-korum. There we also read the legend: »This path, from Nubra to Yarkund, is used only when the bed of the River is too full to be crossed and recrossed by wading.»

The Nubra valley is also marked in its correct direction. North of the Kara-korum Pass Walker has the source of the Yarkand River. The valleys north of Khopalu join the »Northern Branch of the R. Indus or Shyk Yak R.» One of them, which is called Khondur, must be the Kondus joining the Saltoro valley at Domsum (Dansam). The glacier Vigne ascended must be the Bilafond, judging from its situation and from the legend: »Way over Glacier by Alibransa pass to Yarkund». Near the junction of the Saltoro valley with the Shayok, a northern tributary joins the Saltoro and has the legend: »River whose sources are in the spurs of the Mustak».

Farther west we have the »Shighur Valley». Its eastern branch, »Brahmal Doh» has a »Way to foot of Mustak 8 or 10 days for a footman,» and at its source: »Pass to Hunzi,» and just beyond, on the north side of the Mustak, and its »Pass to Yarkund» we read along a river: »7 days march to the Junction with the Kara-korum road to Yarkund».

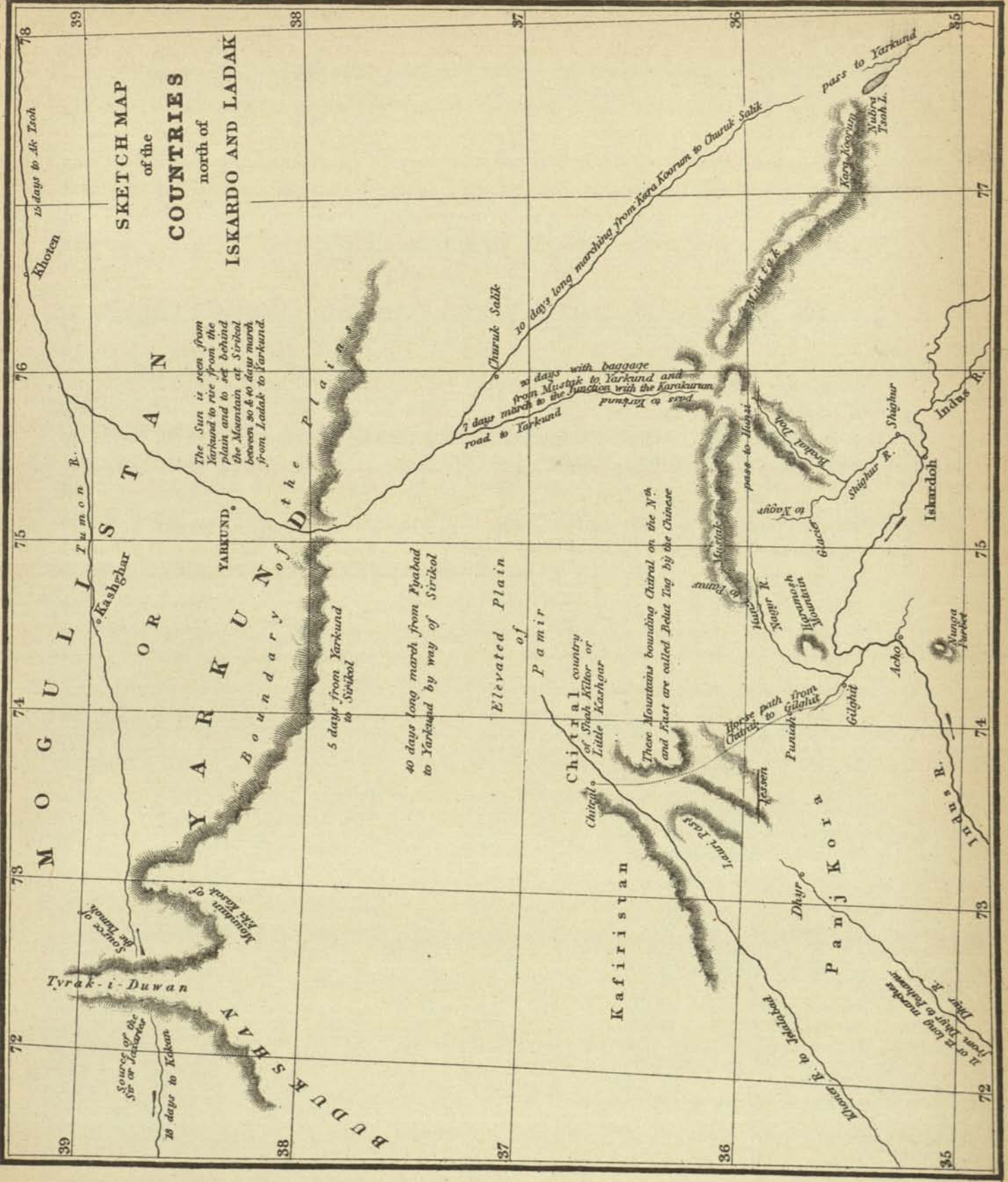
¹ *Map of Kashmir; With its Passes; Ladak & Little Tibet, the Mountain Course of the Indus; and the Alpine Panjab generally taken principally from the MSS. Surveys of G. T. Vigne, Esq. F. G. S. Compiled by Order of the Court of Directors of the East India Company. By John Walker.*

At the top of the Basha valley he has »Arundoh» and its »Immense moving Glacier» and, coming in from the north, a valley corresponding to the Kero Lungma and »3 days with Coolies to Nagyr,» at the top of which is a »pass», corresponding to the Nushik-la.

Along the Mustak Range he has the legend: »The Mustak is extended from Gilghit to Nubra, and visible from the top of the Subu Pass, between Ladak and Nubra.» Ladak is called Middle Tibet, or Butan or Bod. The eastern tributary to the Shayok on which he has the legend: »Stream from Chang Thung or the shepherds' Plains,» is probably the Chang-chenmo, which later on was to be explored by Henry Strachey.

There is also a *Sketch map* (Pl. XLI), of the Countries north of Iskardo and Ladak, which gives us a not at all bad idea of the situation of the Kwen-lun and Kara-korum Mountains.¹ Considering the early date at which the maps of Vigne were drawn, they must be said to be marvellously well done. From some points of view Vigne had a clearer idea of the Kara-korum Mountains than even SHAW who travelled more than 30 years later. He is the first scientifically trained traveller who has visited these regions and who has returned with perfectly reliable material gained by personal observation. Vigne believed that the principal crest of the Kara-korum was passed on the road between the Shayok and Yarkand, as is indeed the case, but at the same time he correctly interpreted the descriptions he got from natives, saying that to the east of the Kara-korum road the country becomes more flat and open, while to the west the high snow-covered group of the Mus-tagh was to be found. This was what RITTER and GRIMM on their maps and diagrams had called the Baltü-Glätcher or glaciers of Baltistan. And finally Vigne collected very interesting information about the roads crossing these nearly inaccessible regions; amongst others, the road crossing the Mustagh Pass.

¹ *Sketch Map of the Countries north of Iskardo and Ladak*, drawn by John Walker 1842. *Travels in Kashmir, Ladak, Iskardo, etc.* London 1844.



Map of John Walker to G. T. Vigné's journey, 1842.

CHAPTER XXII.

CSOMA, ZIMMERMANN, HELMERSEN, AND OTHERS.

Before continuing our review of travellers and explorers who have personally visited the Kara-korum regions, I will quote a few extracts from the writings of authors, most of whom have arrived at their conclusions from descriptions and whose information is, therefore, second hand. Such a review must necessarily be rather heterogeneous, but the facts, even if far from being complete, may be of interest, and should not be omitted.

ALEXANDER CSOMA DE KÖRÖS has already been spoken of in connection with the Sacred Lake and Transhimalaya.¹ But still we have to return once more to his important *Geographical Notice of Tibet*.² As quoted above the Tibetans, according to Csoma, reckon six ranges of mountains running N. W.—S. E. from Himalaya to the plains of Tartary,

when viewed from Kangri in Nari, whence the ground commences to take on one side a northwestern, and on the other side a southeastern inclination. In the spacious valley, which is between the third and fourth range of the before-mentioned mountains, is the great road of communication between Ladak and Utsang. The principal countries or districts in this direction from northwest, are as follows: Beltistan or Little Tibet, Ladak, Teshigang, Gar or Garo (the lower and upper), Troshot, Tsang, U, Bhrigang. It is here likewise, that the two principal rivers, the Sengé k'ha-bab, and the Tsanpo take their course; that by Ladak to the northwest, and may be taken for the principal branch of

¹ Vol. II, p. 61, and Vol. III, p. 72.

² *Journal Asiatic Society of Bengal*, No. 4. April 1832, p. 121 *et seq.* It was reprinted in *The Chinese Repository*. Vol. XIII. October 1844, Nr. 10, under the following title and accompanied by a note: *Art. I Geographical Notice of Tibet; its divisions and principal cities, with notices of its lakes, glaciers, mines etc. From the Journal of the Asiatic Society.*

»(Note. This notice of Tibet was furnished to the Journal of the Asiatic Society in April 1832, by the late Alex. Csoma de Körös, who lived several years in the country, and is introduced into the Repository as a part of the series of geographical papers given in this work. In order to enable the reader to find some of the places mentioned in it on Chinese maps, the characters of those we have been able to recognize are given in notes. The radical difference, however, between the Tibetan and Chinese languages, and the absence of any positions given to the places, render it difficult to identify many of them.)»

the Indus, this to the southeast, and forms afterwards the Brahmaputra.¹ Beyond the fourth range of the Himalaya mountains, or in the next valley to the north of Ladak, there are the following districts, counting them eastward: Nubra, Rudok, Tsotso, Bomba, Chang-ts'hak'ha, Chang-ra greng.

The fourth of these ranges is the Transhimalayan System or at least the southern ranges of it, and, therefore, is also in connection with the Kara-korum. Of the latter the Tibetans have nearly no knowledge at all. — Csoma's description of Ngari from Tibetan information runs as follows:

The northwestern part of Tibet from Tsing to Ladak, is called Nari. It is of very great extent but the number of inhabitants is inconsiderable, not exceeding fifty thousand families together with Ladak and Beltistan. There have been several small principalities formerly in Nari, as, Gugé, Purang, Kangri: but all these belong now to the great lama at H'lassa, and are governed by k'harpons (commanders of forts) sent from H'lassa. There are also in Nari very extensive deserts. The inhabitants dwell in tents, made of hair cloth; exercise a pastoral life, without any agriculture. Their number is said to amount to ten thousand families, and they all are under the sgar-pon or chief officer residing at sGar or sGarö, who is sent from U-tsang or H'lassa, and generally remains there for three years.

Gugé, part of Nari, lying to the north of Garhwal and Kamaon, consists of two valleys, inhabited by somewhat more than two thousand families. The principal places are Tsaprang and Tholing, not far from each other. The first is the residence of the commanding officer called the K'harpon of Tsaprang and the second is a large monastery and the seat of a lama styled the K'hanpo of Tholing. He resides during the summer at Teshigang, another large monastery, a few days journey to the north from Tholing. These two places, Tsaprang and Tholing, have been the residence of the princes that have reigned there from the 10th till the end of the 17th century.

Ladak, formerly called Mar-yul, still has its own prince, but he must accommodate himself to the political views of the Chinese. Zanskar, Purik, Nubra, form part of this principality. In the whole of Ladak the number of the inhabitants does not exceed twenty thousand families. Nearly the half of them are Mohammedans, mostly of the Shia persuasion. Lé (Slé) is the capital of Ladak, the residence of the prince, and the emporium of a considerable trade with Turkestan, H'lassa, and the Panjab countries. It is about 15 to 20 days' journey from Cashmir to the east, and nearly under the same latitude (*i. e.* 34° north).

Little Tibet or Beltistan (Belti-yul in Tibetan), is the most northwestern part of Tibet. There are several chiefs. The chief residing at Kardo is the most powerful among them; those of Kyeré and Kuru, with some others, depend on the former. The chief of Shigar holds sometimes with the prince of Ladak and sometimes with the chief of Kardo. The chiefs of Minaro, Hasora etc. are the heads of some predatory tribes. In the several defiles to the south, in the neighbourhood of Beltistan, there live some predatory tribes, among whom the most notorious are the Dardu people. These barbarous tribes are either of Afghan or Hindu origin. The inhabitants of Beltistan are Mohammedans of

¹ As a curiosity the following note in *The Chinese Repository* may be quoted — in which we recognize the great mistake made by Klaproth: The Tsanpo or Yari Tsangbo is now ascertained to be the Irrawady, the great river of Burmah. The Sengé k'ha-bab is probably the Ganga or Kang-hoh of Chinese maps. Cf. *Chin. Rep.* Vol. I, pp. 176, 177.

the Shia persuasion. They speak a dialect of the Tibetan language, but have nothing of the Tibetan literature. They keep some books or fragments in Persian. The correspondence from Ladak with the chiefs of those parts, is carried on in Persian, as also with Cashmir. The people of Beltistan are very unhappy on account of their chiefs having continual quarrels with each other, or with the prince of Ladak. The climate is warm. In the lower part of Beltistan, snow never falls. The soil is good. There are several sorts of excellent fruits; as of apples, pears, peaches, plums, figs, grapes, mulberries etc. etc. There is great want of salt and wool in those parts. Formerly there existed a commercial route of 30 days' journey from Cashmir to Yarkand through Beltistan, but that country being in an unsettled state, the Cashmirian merchants afterwards preferred that through Lé in Ladak, although it is very circuitous.

This description from native sources is interesting as it dates from a period only a few years before the occupation of Ladak by Gulab Sing's general Zorawar, which took place in 1834—1840, whilst the conquest of Baltistan followed in 1841. The old trade road across the Kara-korum and Baltistan is also mentioned. It was abandoned on account of raids of robbing bands, not on account of ice and snow. Therefore, the safer road of the Kara-korum Pass was chosen by the merchants between Kashmir and Yarkand. In connection with these roads one would have expected to find a few words of the great Kara-korum glaciers, but there is nothing about them. Nor are they mentioned under the heading *Glaciers*: »The summits of many of the Tibetan mountains remain through the whole year covered with snow. But there are especially four glaciers or mountains covered with ice or frozen snow; as Tisé, Havo, Shampo, and Pulé.»

Gold and other metals as well as fossils are mentioned as follows:

Mines. — Mines are rarely excavated in Tibet. In the northern part of Nari, and in Gugé, some gold dust is gathered, as also in Zanskar and Beltistan it is washed from the rivers. If they knew how to work mines, they might find in many places gold, copper, iron and lead.

Petrifactions are found at many places in Tibet, especially in Naru. On the 2d and 3d range of the Himalaya mountains, there are several sorts of them. Salgrams and shells are found most frequently, in many places. All such petrifactions are denominated in Tibetan, according to the resemblance they have to things; as sheep-eye, sheep-horn, sheep-brain, swine-brain, swine-head, bird-leg, cow-tongue, stone-trumpet etc. They are not objects of reverence in Tibet, neither of curiosity. Some of them, after being burnt and reduced to powder, are used as medicaments in certain diseases.

The following distinction between the highland deserts and the cultivable ground is good:

In middle Tibet and Ladak the mountains are in general naked, destitute of herb, grass and every vegetable. In the valleys, where the fields can be watered or irrigated, several kinds of corn are produced, especially wheat, barley, buckwheat, millet, pease, and some others. In Nari and in the northern deserts of Tibet, there grow several kinds of medical herbs and plants, and there are likewise good pastures; but there are in the deserts no fields for producing corn, and what they want they purchase from those who

inhabit the southern parts of Nari, and give them in exchange yak, sheep, wool, woollen cloth, salt, borax, etc.

With these statements from Tibetan sources the following that is derived from Chinese sources should be compared. It is a little article on Tibet published the same year as Csoma's *Notice on Tibet*.¹ The map of the Ta-tsing dynasty is especially quoted. Only a few extracts regarding Tibet in general and Southern Tibet in particular are to be inserted here:

Thibet is perhaps the least known of all the countries of central Asia, — — — although not a little has, at various times, been written concerning it. We hesitated, at first, whether to include it among the colonial possessions of China or not: but our map plainly points it out as a colony; as does also the form of its government.

In the paragraph about the rivers the great mistakes regarding the Ganga and the Tsangpo are maintained, and for the latter D'ANVILLE is quoted as an authority:

Rivers. Thibet, like Koko-nor, is watered by several large rivers, and also by a great number of minor streams. In particular, it gives rise to the great river of Burmah — the Irrawaddy or Errabatty, named in Thibet the Yarou-tsangbo, and to the Ganga, formerly supposed to be the Ganges, but now generally considered as the source of the Indus. The Bo-tsangbo or Gakbo-tsangbo, the Khara-ousou or Noo-keang, the Lan-tsang-keang, the Mou-tchou, and the Peng-tchou, also have their origin in Thibet.

The Yarou-tsangbo-tchou, or Irrawaddy, is the chief river of Thibet. Its source is in the Tam-tchouk hills, a branch of the chain of Kentaisse or Kangtise-ri, on the eastern frontier of Ari. Thence it flows almost in the same parallel from east to west, for about 15 degrees, through the whole extent of Tsang and Wei; passing on the north of Chashi-loumbou, and the south of H'lassa. As it flows from the province of Wei into that of Kham, it turns a little southward, and enters H'lokba, on the west of the Noo-e tribes; thence it passes for a short distance through Yunnan, and enters Burmah; where it flows in a S. S. W. course till it falls into the sea near Martaban. The Yarou-tsangbo was supposed by Major Rennell, in 1765, to be connected with the Berhampooter, and most geographers, since that time, have followed his conjecture, in preference to the more correct one of *D'Anville*. It is evident, however, from Chinese works, and from a variety of circumstances, that the Yarou-tsangbo is the Irrawaddy of Burmah; and it is probable that the Berhampooter has its origin in the Brahma-kound, among the barbarous and almost unknown tribes on the south of Thibet, whose country is watered by the Yarou-tsangbo. Perhaps, also the Mou-tchou, which rises on the south-east of the lake Yamorouk or Palte, joins the Berhampooter not far from its source.

The Ganga has two sources, Lang-tchou and La-tchou; the former of which rises in the lake Mapam-dalai, north of the mountains of Kangtise, or Kentaisse, between the provinces of Tsang and Ari, in about the 30th. parallel of latitude; the other rises a little farther northward, in the Senkeh hills. These two streams, after flowing about six degrees westward, nearly parallel to each other, in the province of Ari, or Ladak, unite and receive the name of Ganga. Thence the Ganga takes a southern direction, for a distance of 100 or 120 miles, and afterwards turns and runs eastward, in a more serpentine course, till it reaches the longitude of its source. It then flows south-eastward, into the kingdom of Gorka.

¹ *The Chinese Repository*. Vol. I. Canton 1832—33, p. 173—178.

Finally there is a short paragraph about the mountains of Tibet, where we as usual miss the Kara-korum, though a part of the eastern Transhimalaya is at least mentioned:

Mountains. Thibet is not only a very elevated, but also a mountainous country. But if we can rely on Chinese authorities, it does not possess any of those lofty and extensive ranges of mountains, which are commonly represented as forming one of its most prominent features. If, indeed, with Malte-Brun, we include the kingdoms of Boutan, Nepaul and Gorka among the component parts of Thibet, then we must acknowledge it to possess the most majestic and lofty mountains in the world — the great Himalaya chain, which forms the southern support of all the elevated tracts of central Asia. But as these kingdoms do not appertain either to the Dalai-lama or the Bantchin-erdeni, nor yet are in any way comprehended among the possessions of China, they do not come within our present province. We therefore confine our remarks to those mountains which we find laid down with certainty in our maps.

The principal of these are the following: the Nomkhoun-oubashi chain, situated on the north of H'lassa, from whence it stretches north-eastward, to the frontiers of Koko-nor, the Langbou mountains, on the north of Chashi-lounbou; the Chour-moutsangula chain on the north of Dingghie, Jounghia, and Nielan and south-east of Chashi-lounbou; and the Kang tise or Kentaisse chain, on the north of Ari, with its branches, the Sengkeh and Langtsien mountains; the former of which is on the north, and the latter on the south of the main chain. All these mountains give rise to various branches and tributaries of the Yarou-tsangbo. The great elevation of Thibet renders its climate extremely cold; and its mountainous nature does not admit of much fertility in the soil. It is a country which has hitherto been but very little known, and which therefore presents a wide field for geographical and scientific research.

Thus both the Tibetan and Chinese sources speak of the great barrenness of the elevated regions in Tibet and state that the mountains are destitute of vegetation. In CSOMA'S report northern Tibet is described as a desert. At this epoch and even many years later a great uncertainty prevailed amongst European geographers regarding the morphology and nature of Tibet, more especially its northern parts. When Csoma writes: »From the first range of the Himalaya Mountains on the Indian side to the plains of Tartary, the Tibetans count six chains of mountains . . . ,»¹ he seems to mean that the highlands of Tibet slowly go over into the plains of Tartary. Three of these ranges were placed south of the Indus-Tsangpo valley, the fourth must be the Transhimalaya. It is extremely unlikely that the fifth and sixth should be the Kara-korum and Kwen-lun. In spite of his deep erudition Csoma could hardly know anything about this complicated orography which was so vividly discussed by British geographers even some forty years later. Father HYACINTH BITCHURIN, who also was a very learned man, speaks of Northern Tibet as a steppe-land. In his *Ancient History of Tibet and Koko-nor* he has a short reference to Khotan where he says:

¹ Cf. Vol. III, p 72 *supra*.

»Khotan, in Chinese Yu-tien and Khotien, is the name of a little country in Eastern Turkestan, which, in the south, borders upon the Tibetan steppes, in the north upon the districts of the cities Kucha, Saïram and others . . .»

His information regarding the Nan-shan or Southern Mountains is, however, in contradiction to the above statement, for he says: »There is also another range called the Southern Mountains, namely the one forming the southern boundary of Eastern Turkestan separating the dominion of Khotan from Tibet.»¹

When at about the same time, the Swedish diplomat Baron C. d'OHSSON published his memorable History of the Mongols, he was perfectly aware of the fact that Tibet was a very vast country full of high mountains, but he was not in a position to control the report given to Chingis Khan in 1223 regarding »thick forests» covering this country.² D'Ohsson says:

Au printemps de l'année 1223, Tchinguiz-khan résolut de retourner en Mongolie, par l'Inde et le Tubbet . . . L'armée prit la route du Tubbet; mais au bout de quelques journées elle reçut contreordre. On reconnut toutes les difficultés qu'elle aurait à vaincre pour traverser une vaste contrée, hérissée de hautes montagnes et couverte d'épaisses forêts. Tchinguiz-khan retourna à Peschavour, pour gagner la route qui l'avait conduit en Perse.

In spite of MIR IZZET ULLAH'S and a few Russians' and Orientals' journeys across the Kara-korum Pass, this road across the whole mass of mountains between India and Eastern Turkestan remained very little known even to geographers. Both north and south of the mountains many Europeans heard of it, even from BERNIER'S and DESIDERI'S time. From 1839 dates a very short notice about it picked up at Orenburg by General GENS:

Aus Kaschgar giebt es einen geraden Weg nach Kaschmir. Er beträgt 28 Tage-reisen, geht über Klein-Tübet und Gross-Tübet, ist aber wegen der hohen und felsigen Berge sehr beschwerlich über welche man 6 Tage zu Fusse gehen muss. (Der Armenier Mehdi Rafailoff legte diesen Weg dennoch zu Pferde zurück.)³

On his journey to Kabul in 1836—38 Sir ALEXANDER BURNES had no opportunity to get more detailed news regarding this road than he had obtained on his previous journey. He only indirectly mentions it when saying: »Native

¹ Исторія Тибета и Хухунора Переведена съ Китайскаго Монахомъ Іакинфомъ Вичуринимъ. Часть II, Санктпетербургъ, 1833, p. 232 and 254. — A very nice little map illustrates this work though it embraces only the northern half of Eastern Tibet, including Koko-nor and the lakes at the sources of the Hwang-ho.

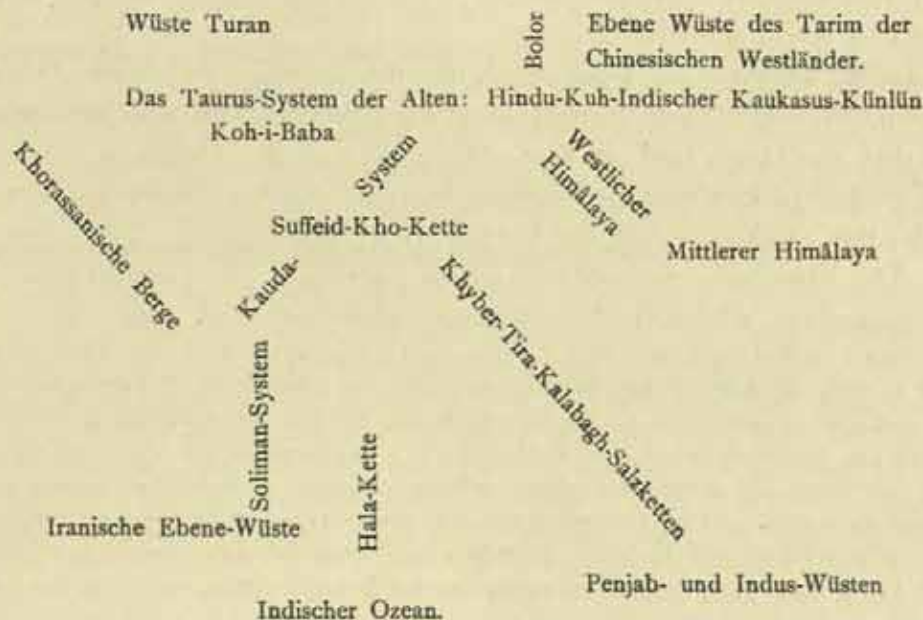
² *Histoire des Mongols, depuis Tchinguiz-Khan jusqu'à Timour Bey ou Tamerlan*; par M. le Baron C. d'Ohsson. Tome premier. La Haye et Amsterdam, 1834, p. 318. — Dr. J. CHARPENTIER shows that Mr. CURTIN'S book: *The Mongols, A History*. London 1907, provided with an enthusiastic preface by the late President ROOSEVELT, from beginning to end is a shameless plagiarism of d'Ohsson's work (*Vilhelms av Ruysbroeck Resa genom Asien 1253—1255*. Stockholm 1919, p. 7).

³ *Nachrichten über Chiwa, Buchara, Chokand und den nordwestlichen Theil des chinesischen Staates*, gesammelt von dem Präsidenten der asiat. Grenz-Comp. in Orenburg General Major Gens, bearbeitet von Gr. v. Helmersen (*Beiträge zur Kenntniss des Russischen Reiches*, II). St. Petersburg 1839, p. 98.

Russians and Armenians pass through Cashgar to Tibet, and even lower down; but the Chinese arrest the progress of all eastward of Yarkand The people of Cashgar itself are composed of Turks and Uzbeks, and visitors also arrive from Tibet and Cashmeer.»¹

As to the principal orographical features of the interior of Asia nearly all intelligent geographers followed HUMBOLDT as a leader. A few examples will be enough. Speaking of the »Normal Directions of the ranges» C. ZIMMERMANN says: »Herr Alex. von Humboldt hat diesen Gegenstand insbesondere behandelt und so vollständig erwiesen, dass jeder, welcher im Stande ist, den Untersuchungen zu folgen, von der allgemeinen Wahrheit des in den Grund-Lineamenten entworfenen Reliefs von Hinter-Asien überzeugt werden muss.»²

Zimmermann's graphical arrangement of the names of the mountain ranges represented here, is also influenced by Humboldt:



From this schematic diagram appears that the Hindu-kush is regarded as the western continuation of the Kwen-lun, whilst the western Himalaya approaches it from the S. E. The highest and most powerful of all the systems, the Kara-korum, which ought to have come in between Künlün and Westlicher Himalaja, is missing altogether. Zimmermann has, however, a feeling of the existence of a mountain range south of

¹ *Cabool: being a personal narrative of a Journey to, and Residence in that city, in the years 1836, 7, and 8.* London 1842, p. 222, 223. On this journey Burnes had an opportunity to make sure of the real difference between the two Kashgars.

² *Geographische Analyse der Karte von Inner-Asien.* Berlin 1841, p. 62. The same author regards the upper course of the »Ladak River» as not quite ascertained (*ibid.* p. 38).

the Pamir, for he says: Westlich von dem Querjoch Belur liegt die Station Pamir, fast im Parallel von Kaschgar, also ungefähr in $39\frac{1}{2}^{\circ}$ Breite; nach dieser hat Marco Polo eine Hochebene genannt, aus welcher neuere Geographen südlicher bald eine Gebirgskette, bald eine eigene Provinz machen.¹

The same author believes that the Ping-shan of Chinese geographers is identical with Bolor, though their Icy Mountains are the Kara-korum so far as this system was known to them. In this connection he quotes a passage from the *Asiatic Journal* 1828, p. 397. »The Chinese geographers say, that although beyond Yarkand, across the Imaus Mountains (called by them also Ping-shan, 'icy mountains') the road is very craggy and difficult; still there is between Ye-urh-keang and Wan-too-sze-tan (Yarchand and Hindoostan) a going and coming highway, or great road, and in its neighbourhood there are a great many gemproducing mountains.« And Zimmermann adds: Es bildet sich in dieser Gegend Inner-Asiens also ein Gebirgsland aus gitterförmig sich durchsetzenden Eisketten gebaut, welches der Indus in der Iscardo-Landschaft Randoh schon durchbrochen hat.

The question whether the Hindu-kush be the continuation of the Himalaya or the Kwen-lun, has also been touched upon by ZIMMERMANN who criticises the English view that the Hindu-kush is the prolongation of the Himalaya. Both the stretching and geological structure are different, he says. ALEX. VON HUMBOLDT had proved it to be the continuation of the Kwen-lun, a view that had been confirmed by GERARD. The latter only indirectly mentions the Kara-korum. Zimmermann has the following quotation,² where the Kara-korum regions are dealt with:

As the routes to Yarkund are free of snow at this season of the year, they may not be so elevated as they appear. When in the open plains of Turkestan, the thought (which had often amused us) occurred, — is the Hindu Kush the true limit of the great snowy chain that forms the northern frontier of British India? In seeking for the continuity of the Himalaya, we must go north of Ladak and the sources of the Oxus, where a vast tract of lofty summits will be found to tend towards the *skirts* of Yarkund and somewhere near the heads of the Oxus and Jaxartes, to define the scope of the country to the north-west; this will bring the high plateaux, north of the Indus, within more precise limits. All this tract, which is by no means very remote, is still unseen by the eye of civilized man.

From GERARD'S and HÜGEL'S Journals he draws the conclusion that Tibet is no continuous plateau-land, and that the plateau itself stretches far more to the north than was hitherto supposed. He disproves, however, the term »Tafelland« for northern Tibet.

It is the more surprising that Zimmermann in his text makes no attempt to give to the Kara-korum its due place, as this system plays no unimportant part on

¹ *Der Kriegsschauplatz in Inner-Asien oder Bemerkungen zu der Uebersichtskarte von Afghanistan, dem Penjab und dem Lande am untern Indus. Nach englischen Quellen herausgegeben von Carl Zimmermann.* Berlin 1842, p. 104 et seq.

² *Asiatic Journal*, September-December 1833, p. 115.



Zimmermann's map of 1842.

his map, of which Pl. XLII occupies the N. E. corner.¹ This map is of great interest as it may be said to contain everything known about the region in question, in 1842. Curiously enough he has sketched the mountains as seen in a horizontal perspective, just as the Chinese do. So far as can be read from this map, the Hindu-kush seems far more to be a continuation of the Himalaya than of the Kuen-lun, which rather seems to lose itself in the mountainous regions north of the Hindu-kush. This view is not in accordance with the text nor with Humboldt's schematic maps.

North-east of the Upper Indus, and crossed by the caravan road from Leh to Yarkand, we find a short but rather mighty range called Karakorum or Padischa Kette. We have already found the mistake about the two different names in RITTER. North of this range is another, Baltü Gletscher, also from Ritter, and being in very intimate connection with the Kuenlün. In the latter is the Pass Kara-korum, though, curiously enough, not between Yapchan and Barangsar as it ought to be, but a considerable distance east of the road. The next range on the road is Nanschan Pingschan, which may be said to be a misunderstanding as set forth in Vol. VIII. Neither of these two names has a local *raison d'être* at this place. Tcheragh-saldi and Yagni Dawan are shown as ranges, and Santchutak, Sanju-tagh, is there south of Khotan. The Thsungling of the map may be said to be drawn as a western prolongation of the Nanshan. Notwithstanding the British sources, we trace the orographical conception of HUMBOLDT and RITTER on this well-drawn map.

Humboldt's orographical skeleton of High Asia is still more clearly to be noticed in HELMERSEN'S article on ALEX. LEHMANN'S journey to Bokhara and Samarkand in 1841 and 1842. He regards the Pamir plateau as situated east of Bolor, and complains of the very scanty knowledge possessed in Europe, of these regions, which are situated just north of the Kara-korum System. As regards future exploration he was very pessimistic. Speaking of the Tian-shan, Helmersen says:

Dieses ostwestlich streichende Gebirge wird bekanntlich unter rechtem Winkel von dem hohen Bolor oder Belor-Tag gekreuzt, der weiter südlich auch den Kuenlung und die Himalayakette durchschneidet. Im obern Säräfschan-thale musste Lehmann sich dem Bolor und dem östlich an diesen grenzenden Plateau von Pamir bis auf 250 oder 300 Werst genähert haben. Welch ein Gewinn wäre es für die Kenntniss Hochasiens gewesen, wenn Lehmann diese kurze Strecke noch hätte zurücklegen und jene oftgenannten, aber nur noch dürftig erkannten Gebirgsgegenden betreten können. Weder wir noch unsere nächsten Nachkommen werden die Zeit erleben, wo Europäer sich frei und gefahrlos in Innerasien werden bewegen können.²

¹ *Übersichts-Blatt von Afghanistan und den Ländern an der Nord-West Grenze von Indien darstellend die Hochländer, Fruchtgebiete, Wüsten, Strassen und Pässe. Vornehmlich nach englischen Karten herausgegeben von Carl Zimmermann.*

² G. Helmersen: *Alexander Lehmann's Reise nach Buchara und Samarkand in den Jahren 1841 und 1842*, in: *Beiträge zur Kenntniss des Russischen Reiches etc.* herausgegeben von K. E. v. Baer und Gr. v. Helmersen. St. Petersburg 1852, p. 26.

In the preface to the fourth volume of *Lettres édifiantes*, edition 1843, we are told that the letters contained in that volume are written by Father GAUBIL and that they had previously been published in *Journal Asiatique*. There is a *résumé* of the «present situation» in China, which obviously is compiled by the editors and thus refers to 1843. Little Bokhary is thus described:

La petite Buckarie forme un plateau entouré de hautes montagnes. Elle renferme de vastes plaines sablonneuses, et beaucoup de rivières qui vont se perdre dans de grands lacs sans communication connue avec la mer Le Khotan vient des monts de glace, au nord (sud!). Il commence par trois sources, trois branches qu'on nomme Yu blanc, Yu noir, Yu vert, du nom du mineral qu'on trouve en ces régions, et que les Chinois nomment Yu: c'est le jade, si précieux pour tous les peuples asiatiques.

Of Tibet and the mountains bordering this country to the north, west and south we read:

En se rapprochant de nos jours, on trouve les divisions de grand et de petit Thibet; puis on y a ajouté le Boutan. Mais plus récemment nos géographes ont réparti tout ce vaste pays en quatre provinces, savoir: celle de Ngari, celle de Thsang, celle de Oueï, celle de Khamkam. — La province de Ngari comprend le Thibet occidental, petit Thibet ou pays de Ladak. Elle a deux cent cinquante lieues de l'est à l'ouest, cent du nord au sud, et elle est enfermée entre les monts Koulkoum, Bolor, Himalaya. — Les monts Bolor qui sont à l'ouest, frappés d'un hiver éternel, donnent asile à des tribus demi-sauvages, et dans les vallées qui les coupent il y a des troupes de chevaux et d'antilopes dont la chasse donne de grand produits.¹

This is far better than the boundaries given in the *Mémoire sur le Thibet et sur le royaume des éleuthes* where the western boundary as we have seen before is said to be the great sand desert:

A l'ouest, il s'étend jusqu'à Ta-cha-Hay, c'est-à-dire jusqu'au pays sablonneux, ou à la mer de sable; car c'est ce que désignent ces trois mots chinois. — Au nord, il va jusqu'aux frontières du Tsing-Hay, ou du pays de Coconor.²

The Kara-korum has not yet conquered its due place in the orographical system of Asia. The geographers are talking of the Altai, the Kwen-lun, the Bolor and the Himalaya, but the most powerful of them all from several points of view, is not even mentioned. Having discussed the Altai in his History of geographical discoveries VIVIEN DE SAINT-MARTIN goes on to say:

La chaîne du sud appartient à un système plus considérable encore que le précédent. La partie centrale, celle sur laquelle le Plateau s'appuie à peu près sous les mêmes longitudes que l'Altai, a reçu des Chinois le nom de Kouan-loun, ou Montagnes Célestes, comme si la hauteur inaccessible de ces énormes masses en eût fait à leurs yeux les colonnes du ciel. A ce système de Kouan-loun se rattache l'Himalaïa, chaîne, beaucoup plus célèbre et couronnée de pics plus élevés encore que ceux du Kouan-loun, bien que d'un ordre géologiquement secondaire dans cette immense ossature du continent oriental. Le Kouan-loun se prolonge d'un côté à travers le Tibet et la Chine jusqu'à l'océan Oriental³

¹ *Lettres édifiantes*. Tome quatrième. Paris MDCCCXLIII, p. 21.

² *Lettres édifiantes*. Tome troisième. Paris MDCCCXLIII, p. 519.

³ *Histoire des découvertes géographiques*. Tome II. Paris 1845, p. 5.

The fact that Bolor was known to Europe more than 600 years ago is due to MARCO POLO — to the Chinese it was known, as we will see, at a much earlier date. The translations of Chinese geographical works made the Kwen-lun known, and as to the Himalaya, it had been famous ever since antiquity. But the Kara-korum was and remained very well hidden behind and amongst the other mountains, and the road between Leh and Yarkand was not sufficient for making it known. In 1845 European scholars, as a rule, believed that the Himalaya came into direct contact with the Kwen-lun, forgetting or ignoring the system of Kara-korum coming in between them and separating them from each other. REINAUD, speaking of the black-haired people that in olden times lived in the valley of the Yellow River, says of them:

Le berceau de cette nation semble devoir être placé sur les degrés inférieurs d'une des grandes chaînes de l'Asie centrale, le Kouen-lun, qui, se liant à l'Himalaya, à son extrémité occidentale, s'étend directement de l'ouest à l'est, jusqu'aux frontières de la Chine. Ces traditions remontent à plus de deux mille ans avant notre ère.¹

The mountain ranges of Ak-tau and Kara-tau, stretching along the eastern portion of the Khanat of Bokhara are regarded, by KHANIKOFF, as the continuation of the mountains of Kashgar and Badakshan, *i. e.* the Pamir and Bolor Mountains, and there is, as usual, no mention of the Kara-korum.²

ELIE DE BEAUMONT does not seem to be quite sure of the correctness of HUMBOLDT'S N.-S., and E.-W. stretching systems, for he asks: Peut-être pourra-t-on en séparer un groupe dirigé de l'E. à l'O., Système du Thian-Chan? From the Atlantic to the Gulf of Bengal he joins the mountain ranges into one gigantic system:

Outre les chaînes déjà mentionnées, ce Système comprend l'Atlas, le Taurus, la chaîne centrale du Caucase couronnée par le pic d'Elbrouz, ainsi que la longue série de montagnes qui, sous les noms de Paropamissus, d'Indoukosh, d'Himâlaya, borde au nord les plaines de la Perse et du Bengale, et renferme les cimes les plus élevées de la terre. Toutes ces chaînes courent parallèlement à un grand cercle qu'on représenterait, sur une globe terrestre, par un fil tendu du milieu de l'empire de Maroc au nord de l'empire des Birmans (ou mieux encore, du cap Saint-Vincent au Dhawalagiri).³

If the highest peaks of the earth are to be considered, the Kara-korum has to be included in this gigantic system. Only glimpses had so far pierced the fogs of mystery that veiled these mountains and even learned men, like ERSKINE, when speaking of political boundaries, used such uncertain names as Parapamisan mountains and Tibet mountains, both expressions difficult to define.⁴

¹ *Relation des Voyages faits par les Arabes, etc.* . . . Tome I. Paris 1845, p. CXLIX.

² *Bokhara: Its Amir and its People.* Transl. by Cl. de Bode. London MDCCCXLV, p. 15.

³ *Notice sur les systèmes de montagnes.* Tome II. Paris 1852, p. 606 and 607.

⁴ William Erskine: *History of India* . . . Vol. I. London 1854, p. 24 and 261.

CHAPTER XXIII.

CUNNINGHAM AND THOMSON.

In the preceding chapters we have seen that much uncertainty still prevailed in Europe regarding the Kara-korum System, or Range, as it was called if mentioned at all. But as a rule it was left out when the great orographical systems were dealt with, and the Kara-korum Pass, which was well known, was still supposed to be situated on the Kwen-lun Range. The most important document on the Kara-korum existing at that time was RITTER'S and GRIMM'S map (Pl. XXXV), for it showed the system not only approximately at its correct place, but it also represented it as consisting of three different ranges. And, last but not least, it rather clearly indicated its orographical connection and affinity with the Kailas and the Transhimalaya. Most of the geographers of the time seem, however, not to have been aware of the existence or importance of this map, which in several respects was many years before its time. And, after all, KLAPROTH'S map of Central Asia, published three years after RITTER'S, overshadowed it as far as the Kara-korum Ranges are concerned, though, on this particular point, it did by no means improve it. A little map was issued in a new edition¹ with the mountain ranges marked out. It reaches only to Nagar in the north and is of no particular importance. It is nearly the same as Pl. XIV in Vol. III. In 1849 B. H. HODGSON published his sketch map of the Himalaya showing the standpoint of the knowledge regarding the general topography of that system and representing the Kailas as a semi-circular range north, east and south of Lake Manasarovar, which was indeed a very primitive idea, especially if compared with the maps of RITTER and KLAPROTH published several years earlier. Still HODGSON'S map of the Himalaya was published also in Germany, and is here reproduced as Pl. II.²

Into the confusion prevailing in Europe regarding our system, clearness and order were brought about by the two excellent English explorers, Major ALEXANDER

¹ *Ost-Indien mit den Inseln, entworfen und gez. v. Fr. Stillpnagel.* Gotha 1849. 1:18 500 000.

² *Geographische Skizze vom Himalaya zur Übersicht seiner natürlichen Eintheilung* von B. H. Hodgson Esq. 1849. Reduzirt und ins Deutsche übertragen von Theodor Schilling 1851.

CUNNINGHAM and Dr. THOMAS THOMSON, who had been commissioned in Ladak and on the Tibetan frontier.¹ A third member of the commission was HENRY STRACHEY. To them the theoretical geography, and the conclusions drawn from old Chinese works and maps were not sufficient — they went personally to the very spot and penetrated the dark country, studying it with their own eyes. With his famous book, *Ladák*, Cunningham brought the knowledge of western Himalaya and Kara-korum a very great step forward, and did more in the right direction than any one before his time.

He identifies the old Chinese Ts'ung-ling or Onion Mountains with the Kara-korum.² He noticed the parallelism of the mountain ranges and rivers from N. W. to S. E. He points out that Ladak on the north is divided by the Kara-korum Mountains from the Chinese district of Khotan. It is especially the Nubra district that is bounded on the north by the Kara-korum.³ Again he mentions the importance of these mountains as an ethnological dividing line: »To the north of the Kárá-korum range, lie the Chinese districts of Yarkand, Kotan, and Káshgár, which, with the exception of the Chinese functionaries, and Tartar soldiers are wholly peopled by Musulmáns.» The Kirghis inhabit the steppes of Pamer beyond the Kara-korum.

It is, however, in his chapter III, »Mountains», that Cunningham enters in a more detailed way upon the question of the Kara-korum. To begin with he says that the western Great Himalaya near the sources of the Gilgit and Kunar rivers joins the mountains of Pamir and Hindu-kush.⁴ He, however, quotes without remarks HUMBOLDT'S view: »The Hindu Kush, or Indian Caucasus, is a continuation of the Kuen-lun of North Tibet.» Speaking of the general parallelism in the Himalaya he continues:⁵ »Beyond the Himálaya the same system of parallel chains will be observed in at least three distinct ranges of mountains, which I propose to call the Trans-Himálaya, the Chushal, and the Kárákorum, or Trans-Tibetan chains.... The Trans-Tibetan range is that which we call the Bolor and Kárákorum, on the west; and which probably merges into the Kuen-lun, on the east. It is in fact the northern limit of the Tibetan people, and of their peculiar language. To the north are the people of Balti, Ladák, and Chang-Thang, who were known to Ptolemy as the Byltae and Chatae Scythae.»

The view regarding the Bolor had subsequently to be corrected. It was in accordance with RITTER'S map. The intimate connection between the Kuen-lun and the Kara-korum was derived from HUMBOLDT, though not in agreement with

¹ Cf. Vol. II, p. 92, 93 *et seq.* and Vol. III, p. 113 *et seq.*

² *Ladák, physical, statistical, and historical; with notices of the surrounding countries*, London 1854, p. 2. — Cf. Vol. VIII.

³ Op. cit., p. 21.

⁴ Op. cit., p. 41.

⁵ Cf. Vol. III, p. 126.

his small maps (Pl. XXIX and Pl. XXXII). When Cunningham says that the Kárá-korum is the northern limit of the Tibetan people he is right, but only for the western portion which he knew. The Kailas or Gangri Range he regards as a separate range S. W. of the Kara-korum. From the crest of the Kara-korum Range to the plains of the Panjab he reckons a breadth of 250 miles, which proves that with the crest of the Kara-korum he means the range in which the Kara-korum Pass is situated.

Then he enters more into details:¹

The Kárákorum, or Trans-Tibetan chain, forms the natural boundary of Ladák, and the small Musulmán districts of Balti, Hunza-Nager, and Gilgit on the north. Nothing whatever is known of this range to the eastward of the upper Shayok river, and of the northern portion we know but little. At the head of the Shayok river, it is called Kárá Koram, which is a Turki word, signifying the «Black Mountains». To the north of Balti it is known as the Bolor range: but this name is only the common appellation of Balti, amongst all the races of Dardu origin.

According to Cunningham Bolor simply means the mountains of Balti, and it is 300 miles in length, whilst the portion of the range which should be called Kárá-korum is 150 miles. »The whole length of the chain, from the eastern sources of the Shayok to the head of the Gilgit river, is 450 miles. The general direction being from east to west.» The meridional mountains called Bolor by HUMBOLDT are, according to CUNNINGHAM, the Pamir. He also criticises VIGNE'S information that »the snow does not remain upon Kárákorum for the greater part of the year», for he himself had heard exactly the reverse from Yarkandi merchants, and he believes that there is always some snow on the Kara-korum Pass. »The probability is that the Kárákorum Pass has about the same elevation as the snow-line of the range.»

Amongst the seven roads leading to Leh and mentioned by Cunningham, two cross the Kara-korum System. The eastern road he calls the one from Chinese Tartary, through Rudok and the valleys of Chushal and Sakte to Leh, which, however, was known only from Leh to Rudok after HENRY STRACHEY'S survey.

The Northern Road leads from Yarkand and Kotan, over the Karakorum mountains (18,600 feet) to Lé. The best account of it that we possess is that by Izzet Ullah, who traversed it in 1812. But since that time several glaciers have stretched their mighty masses across the bed of the Shayok, and the old road by the river, has been completely closed. The new road from Karakorum leaves the Shayok, or Khundan, river at the foot of the pass, and crosses over an elevated table-land to Sassar, where it again meets the Khundan.²

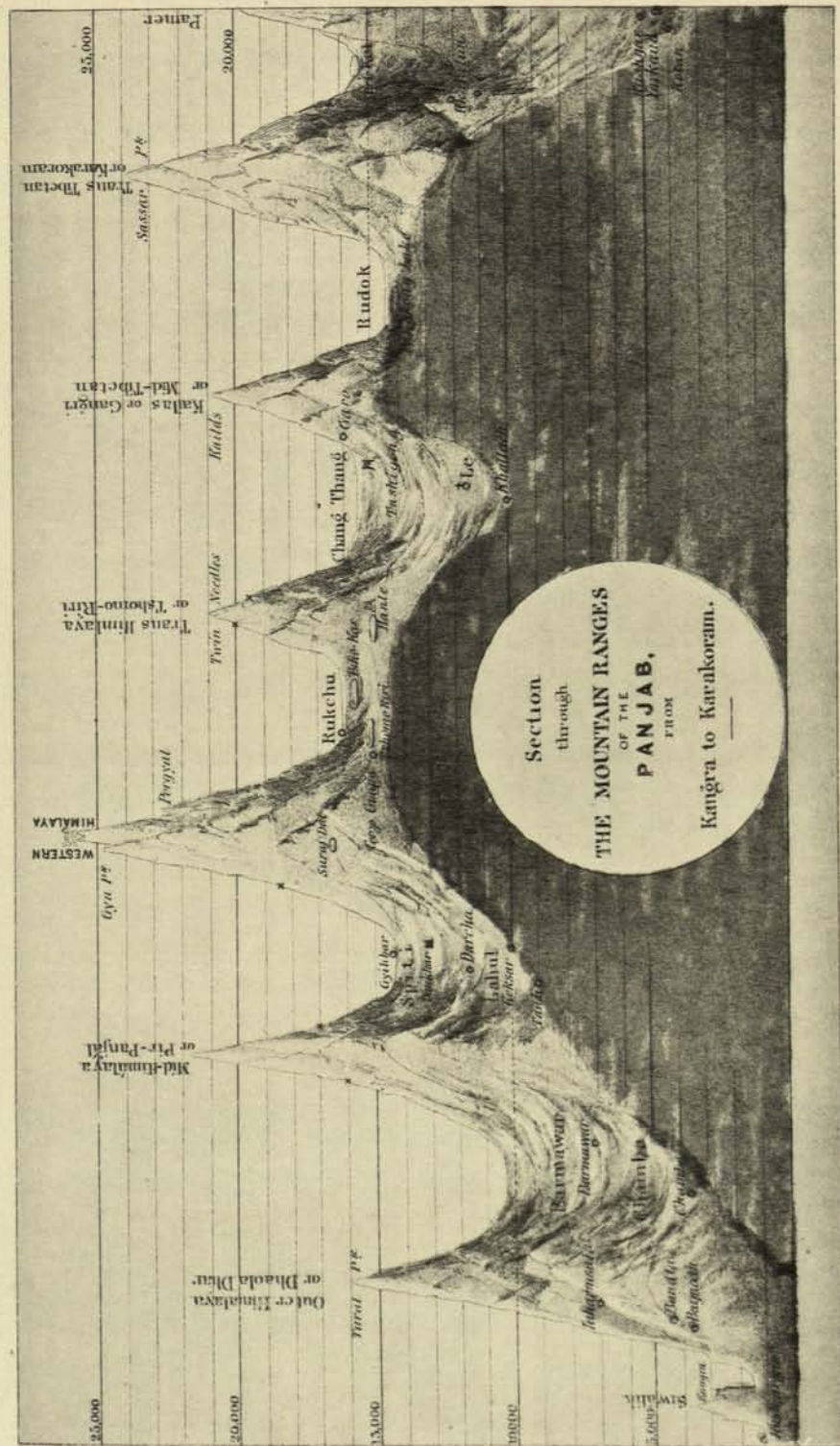
He then quotes all the stations on this road after MIR IZZET ULLAH and THOMSON, and he has a special chapter on the trade between India and Eastern Turkestan, across the Kara-korum Mountains.

¹ Op. cit., p. 45.

² Op. cit., p. 160.



A part of Walker's map to Cunningham's »Ladak», 1854.



Alexander Cunningham, «Ladak», London 1854.

The most important points in Cunningham's Kara-korum are, that he regards the system in connection with the Bolor Mountains, as running from east to west; that it is only one chain, the eastern continuation of which, beyond the Shayok, is unknown; the Kara-korum Pass is situated in the Kara-korum Range and not in the Kwen-lun; and that the northern regions of the chain also are nearly unknown.

The beautiful map of JOHN WALKER, a part of which is shown on Pl. XLIII,¹ shows the Kara-korum as a nearly semi-circular range with its convexity towards the north, and the Kara-korum Pass in its vertex. To the S. E. this range is interrupted, and only N. E. of Panggong-tso there is a range that has the same direction. The Nubra River is running between two considerable ramifications from the Kara-korum Range, both directed to the S. E. The range between the Indus and lower Shayok is called Kailas or Gangri Range. The Singi-kamba or uppermost Indus has one range on each side, both stretching N. W.—S. E., and the Sacred Kailas is represented without connection with any other mountain. The source of the Indus is not on the Kailas, but on the N. E. slopes of the range between the two Indus branches. The source of the Satlej is Tso Mapham or Manasarovar and Tso Langak or Rakas Tal. Cunningham has illustrated his orographical views with a »Section through the Mountain Ranges of the Panjab, from Kangra to Karakoram«, on which he shows the Trans-Tibetan or Karakoram System as a separate range between Rudok and Pamir (Pl. XLIV).

CUNNINGHAM'S journeys in Ladak were accomplished in the years 1846 and 1847. Dr. THOMAS THOMSON travelled in 1847 and 1848. The journeys of the latter mark an epoch in the exploration of these regions so difficult of access and inaugurate a new era in our knowledge of the Kara-korum Mountains. Thomson was a scientifically trained man and a geologist of high rank. He had already made some excursions to Skardo, the Sabu valley, Digar and Nubra, when, July 19th., 1848, he left Leh for a new visit to Nubra *via* the Kardong Pass, and then to the Kara-korum Pass. If we don't count CHERNICHEFF, he may be said to be the first European who ever reached this important point on the great continental water-parting.²

I will now quote a few of the most important passages in THOMSON'S book.

Judging from the horizontally stratified white clay, »the lacustrine formation of Karsar«, which is at least a thousand feet thick, — and from the similar clay he

¹ Its title runs: *Map of the Punjab, Western Himalaya, and adjoining parts of Tibet from recent surveys and based upon the Trigonometrical Survey of India, Compiled by order of the Hon^{ble} Court of Directors of the East India Company by John Walker, 1854.*

² Just after returning from his journey, Thomson wrote: »The natives of Ladakh have no name for the extensive range of snowy mountains which runs from E. S. E. to W. N. W. . . . The name Karakorum is confined to the range N. of the table-land, and in particular to the pass which I ascended. . . . It is curious, that though much lower than the range farther south, it is in fact the dividing range between the central or Yarkand basin and the basin of the Indus, several streams breaking through to get to the Indus.« *Journal R. G. S.*, 1849, p. 25.

had found the previous year at Tertse in lower Nubra, — as well as from the deposits in the Kardong valley, he comes to the conclusion that a big lake has occupied these valleys and that, on account of the great height, it »must have extended up the Tanktse valley, almost as far as the low pass by which that district is separated from the Pangong lake».¹

A mile from Panamik are the hot springs once visited by MOORCROFT.

To the south of Panamik the rocks of Nubra are chiefly black slate, but transported blocks of granite are everywhere common, and at that village the latter rock descends to the level of the river, and continues to form the whole mass of the mountains on the left side of the valley so far as I continued along it. On the right side there were indications of stratification on the steep sides of the mountains, and, from the colour, the rock there appeared to be partly granite and partly metamorphic slate.

He left Taksha in the Nubra valley August 9th, and observed, always opposite to ravines, how the alluvial platforms were covered with enormous boulders, which he believed were brought there by glaciers. At Changlung, where the merchants' road to Yarkand leaves the Nubra valley, he observes: »In the direction of the valley, which was still north-north-west, very lofty mountains were visible at no great distance, all with snowy tops, and generally with heavy snow-beds and glaciers in their hollows; and according to the statement of my guides, the river at the distance of less than two days' journey issues from beneath a glacier, by which all passage is stopped.» To this he adds a note stating that, two months later Captain STRACHEY ascended the same valley till he was stopped by the glaciers which appeared to be on a »still more gigantic scale than those of the Shayok to the eastward».

The range between the Nubra and the Shayok, Thomson found to be bare granite rock, and near the glacier »granite was everywhere the prevailing rock». From old moraines he could see that the glaciers had at some former period advanced much farther than they did in 1848.

The height of the Sassar Pass (Saser-davan) he estimated at 17,600 feet. »From Sassar not more than three or four miles of the upward course of the river were visible, but within that distance three glaciers were in sight. Two of these stopped short of the valley while the third, which was at the most distant point visible, appeared to descend to the river.»²

Thus Thomson affords us a proof that the Kumdan-glaciers, or at any rate one of them, stopped the Shayok road in 1848. Therefore he had to go the roundabout road »called by the Turki merchants, Murgai, by the Tibetans, Murgo-Chumik».

At Murgo he first ascended a platform of conglomerate, where the ground was strewn with fragments of limestone, evidently derived from the mountains above.

¹ *Western Himalaya and Tibet; a Narrative of a Journey through the Mountains of Northern India, during the years 1847—48.* London 1852, p. 400.

² *Op. cit.*, p. 420.

The next two days he marched between limestone rocks. The »plain«, or, as on the map, Table Land, he describes, is Dapsang. He heard of an unfrequented road which was said to go directly to Khotan.

Again he reached what he calls the Shayok, found it to be 30 feet wide and ankle-deep and running from east to west. In reality this is only the eastern tributary of Shayok. On the authority of Yarkand merchants he says, »that formerly travellers used to ascend the Shayok from Sassar, in order to reach the Karakoram pass, instead of pursuing the circuitous route by which I travelled; but that about ten or twelve years ago the glaciers above Sassar descended so low as entirely to prevent any one passing in that direction, for which reason it became necessary to adopt a new road«. Thomson makes a reference to MIR IZZET ULLAH'S journey which proved that then the road up the Shayok was open.

August 19th he reached the Kara-korum Pass and found its height, by boiling point thermometer, to be 18,200 feet. »On the crest of the pass the rock *in situ* was limestone.«

In Thomson's observations at the very place, the view of Humboldt: that the Kara-korum Pass was situated in the Kwen-lun, got a strong support. He describes the open plain to the south of the pass as occupying »a deep concavity in the great chain of the Kouenlun«. ¹ He could distinctly see to the east the main range, a series of snowless, very lofty, black peaks beyond the sources of the most eastern branch of the Shayok; »while the heavily-snowed mountains, the summits of which were seen further east, were probably also a part of the axis of the chain, which apparently bends round the sources of the river of Khotan, or of some stream draining the northern flanks of the Kouenlun«.

He observed the gradual rise of the snow-line to the N. E. and the occurrence of the highest peaks and greatest mass of snow — not on the main axis of the chain, but on its branches, as was also the case in the Himalayas, and this distribution of the snow he attributes to the Indian ocean in the S. W. Even up to 20,000 feet he did not find any continuous snow.

On his way back he visited the Kumdan Glaciers. The first was »most superb« and »entered the bed of the Shayuk at the bottom of a deep bend, and fairly crossed the river, which flowed out below the ice«. The ice did not extend to the foot of the opposite rocks, but only a few feet up the left bank. A second glacier a mile higher up could not be crossed, nor could he ford the deep river in which the glaciers descended. Thomson went up a height »in order to see whether or not there was any lake in sight corresponding to that laid down, from information by Mr. Vigne, as Nubra or Khundan Chu. He could not, however, ascend sufficiently

¹ *Ibidem* p. 436.

high up, but finds it highly improbable that any permanent lake exists. But a temporary lake could be formed by the stoppage of the river by a glacier.

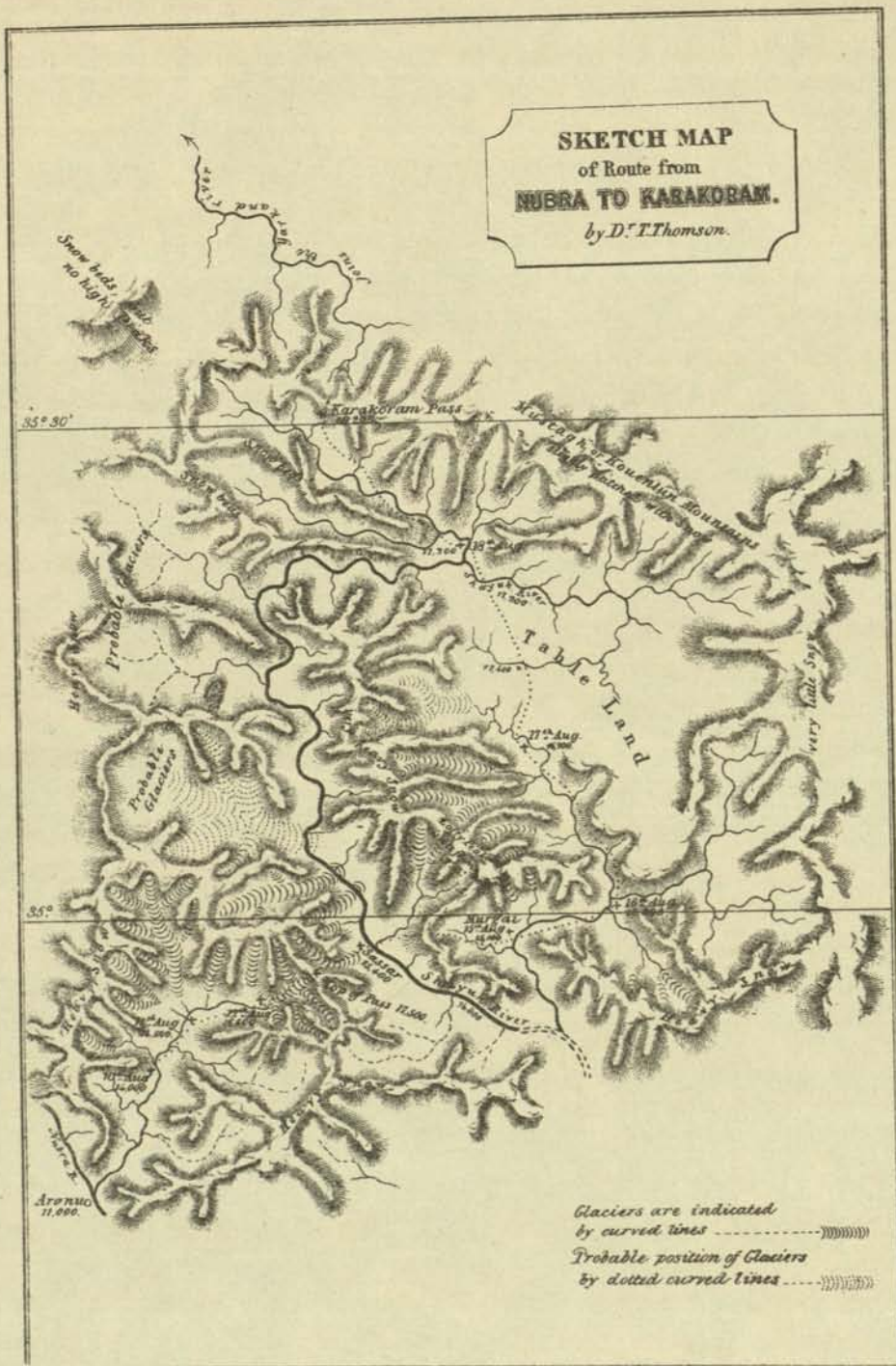
As THOMSON reckons the Kara-korum Pass to the Kwen-lun, it is quite natural that he should regard other passes west and east of it as belonging to the same system. Therefore he says that he knows only four passes over the Kwen-lun. The most westerly is the Muztagh Pass, situated at the source of the right branch of the Shigar river. A road to Yarkand formerly led over this pass, and was frequented by merchants, but had now for many years been unused. It was said to be quite impracticable for horses, from which Thomson inferred that there were many glaciers. The second pass he found marked in VIGNE'S map as the Ali-bransa Pass at the head of the tributary which joins the Shayok opposite Kapalu. The third was the Kara-korum Pass, the only one frequented. The fourth, on the road between Rudok and Khotan, was mentioned by MOORCROFT.

With this material we are justified in concluding that Thomson did not think of the possible existence of still another mighty mountain system north of the one in which he had reached the Kara-korum Pass. He did not confound the Kara-korum with the Kwen-lun and he did not ignore the Kara-korum System. But he was influenced by HUMBOLDT'S theories to believe that the system he had reached was the Kwen-lun, and that Kara-korum was only the name of one of its passes. For he clearly says¹: »To the westward of Karakoram the direction of the Kouenlun is seemingly as nearly as possible parallel to the Indus, but to the east of that pass nothing certain is known regarding it. In Humboldt's map it is laid down as running nearly from west to east on the authority of Chinese geographical works. Its course is unquestionably to the north of the Pangong lake, but till it has been explored by European travellers its direction must, I think, be regarded as involved in much doubt.»

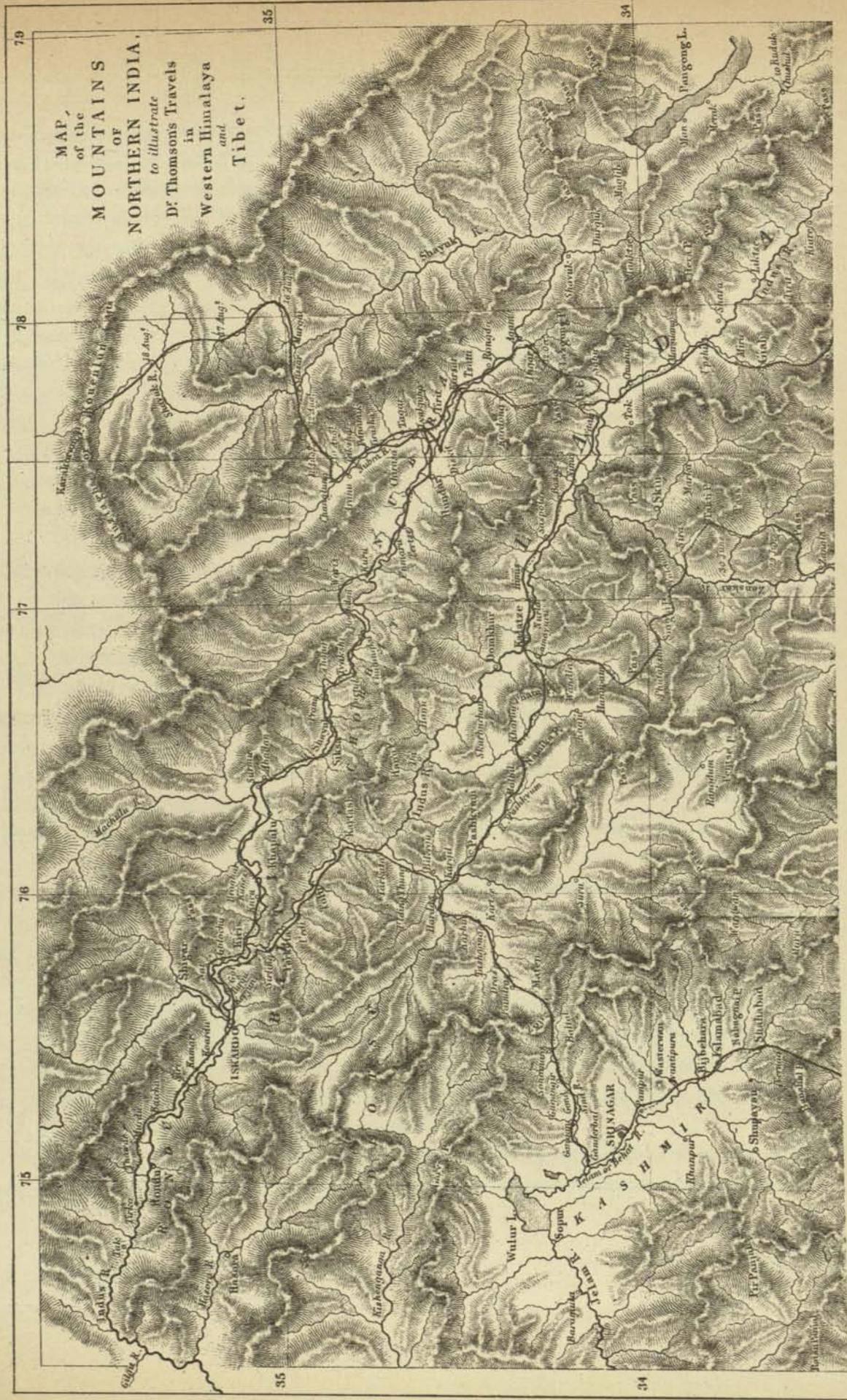
It is refreshing to read such sound and scientifically perspicacious views expressed so long ago. They were to lose something of their authority when SHAW many years later nearly denied the existence of a Kara-korum chain and RAWLINSON misunderstood the geography of these complicated regions. But *now*, it is a pleasure to give Dr. THOMSON the credit he always could claim. Thereby we have only to remember that he calls the northern Kara-korum, Kwen-lun instead of Kara-korum.

But he is perfectly aware of the existence of another lofty range south of the one with the Kara-korum Pass. He is sure that it »runs parallel to the Indus from south-east to north-west. This range, which is continuous with that by which the Indus and Shayok rivers are separated, terminates (or more properly originates) in the still unknown mass of mountains which lies to the north of Lake Manasarovar.» Regarding this range he makes the same mistake as CUNNINGHAM, joining the

¹ *Ibidem* p. 464.



Map of Dr. T. Thomson in »Western Himalaya and Tibet«, London 1852.



Dr. T. Thomson's map 1852.

western Transhimalaya with the Ladak Range. The tract between this southern range and his Kwen-lun he believes to be made up of a number of isolated lake-basins.

Across the southern range MOORCROFT and TREBECK went to Panggong-tso, and from their narrative Thomson understands that the lake basin »had originally an outlet at its north-west extremity, discharging itself along the valley of Tanktse into the Shayok». With this single exception »every part of this country must be viewed as terra incognita».

Thomson regards Western Tibet as »a highly mountainous country, lying on both sides of the river Indus, with its longer axis directed like that river from south-east to north-west. It is bounded on the north-east by the Kouenlun chain of mountains, by which it is separated from the basin of Yarkand.»¹ In these words Thomson emphasises his conviction that the Kara-korum System (his Kwen-lun) is bounding the Tibetan highlands towards Eastern Turkestan.

The height of the mountains of Western Tibet he describes as being pretty much the same. Therefore the valleys are much deeper in the lower courses of the rivers than near their sources, where the mountains are apparently much lower and more rounded. In this he is also correct. In almost all valleys he thought he could recognize unmistakable proofs that they had formerly been occupied by glaciers at much lower levels than at present. He also thought the snow-line went much lower down formerly than now.

His geological observations he summarizes thus: the greater part of Tibet consists of plutonic and metamorphic rocks; granite occurs in great abundance; the stratified rocks strike in a direction which varies between N. W.—S. E. and N. N. W.—S. S. E., and he says: »It is not a little remarkable that a belt twenty miles wide in the direction of this line of strike, drawn from Iskardo to the Niti Pass, would cover every place south of the Indus in which limestone has been observed in Tibet.... Of course the limestone of Nubra and the Karakoram on the one hand, and of Kashmir on the other, cannot in any way be connected with this line.»

On his small sketchmap, Pl. XLV, Thomson has a legend »Probable Glaciers» in the neighbourhood of the place where the Remo glacier is now known to exist. But he does not regard these probable glaciers as the source of the Shayok which he places at the head of the eastern tributary. Both on THOMSON'S and on WALKER'S maps the Chang-chenmo is shown, after the survey of HENRY STRACHEY. The range with the Kara-korum Pass he calls Mustagh or Kouenlun Mountains, and just north of the pass is a river which »joins the Yarkand river». Pl. XLVI is the northern half of the map illustrating Thomson's journey.

It is not exaggerated to say that Dr. Thomson's journey is one of the most important and successful ever undertaken against the secrets of the highest mountain-land of the earth.

¹ *Ibidem*, p. 465.

CHAPTER XXIV.

HOOKER, STRACHEY, MONTGOMERIE, AND OTHERS.

Sir JOSEPH HOOKER had no opportunity to visit the Kara-korum himself, but in his remarkable narrative he sometimes compares his own observations with those of Dr. THOMSON. About the limestone hills east of Cholamoo Lake in Sikkim he says:¹ »This, from its mineral characters, appears to be the same limestone formation which occurs throughout the Himalaya and Western Tibet.« And regarding the snow-line² he fixes, from 95° E. to 75° E., Assam and Kashmir, the lowest limit of perpetual snow at 15,500 or 16,000 feet. The climate becomes drier to the north, the snow-line rises, the vegetation diminishes. »To mention extreme cases; the snow-level of Sikkim 27° 30' is at 16,000 feet, whereas in latitude 35° 30' Dr. Thomson found the snow-line 20,000 feet on the mountains near the Kara-korum Pass, and vegetation up to 18,500 feet — features I found to be common also to Sikkim in latitude 28°.«

We remember from another part of this work³ Hooker's general orography and how the third of his four chains, originating in the mountains near Manasarovar, was »the Kouenlun or Kara-korum chain, dividing the Indus from the Yarkand river«.⁴ When Hooker says that all the waters which flow to the north from his Kara-korum and its eastern continuation, go to lake Lop, he is obviously influenced by Dr. Thomson. But Hooker also, like Thomson, regards the Pamir or »Bolor« as the centre from which the three greatest mountain systems of Asia originate, and of the third of them he says: »The Muzthagh or Karakorum, which probably extends due east into China, south of the Hoang-ho, but which is broken up north of Manasarovar into the chains which have been already enumerated.« Hooker sometimes has Kara-korum or Kouenlun, sometimes Karakorum or Muztagh, but in both cases he means the system in which the Karakorum and Muztagh passes are situated.

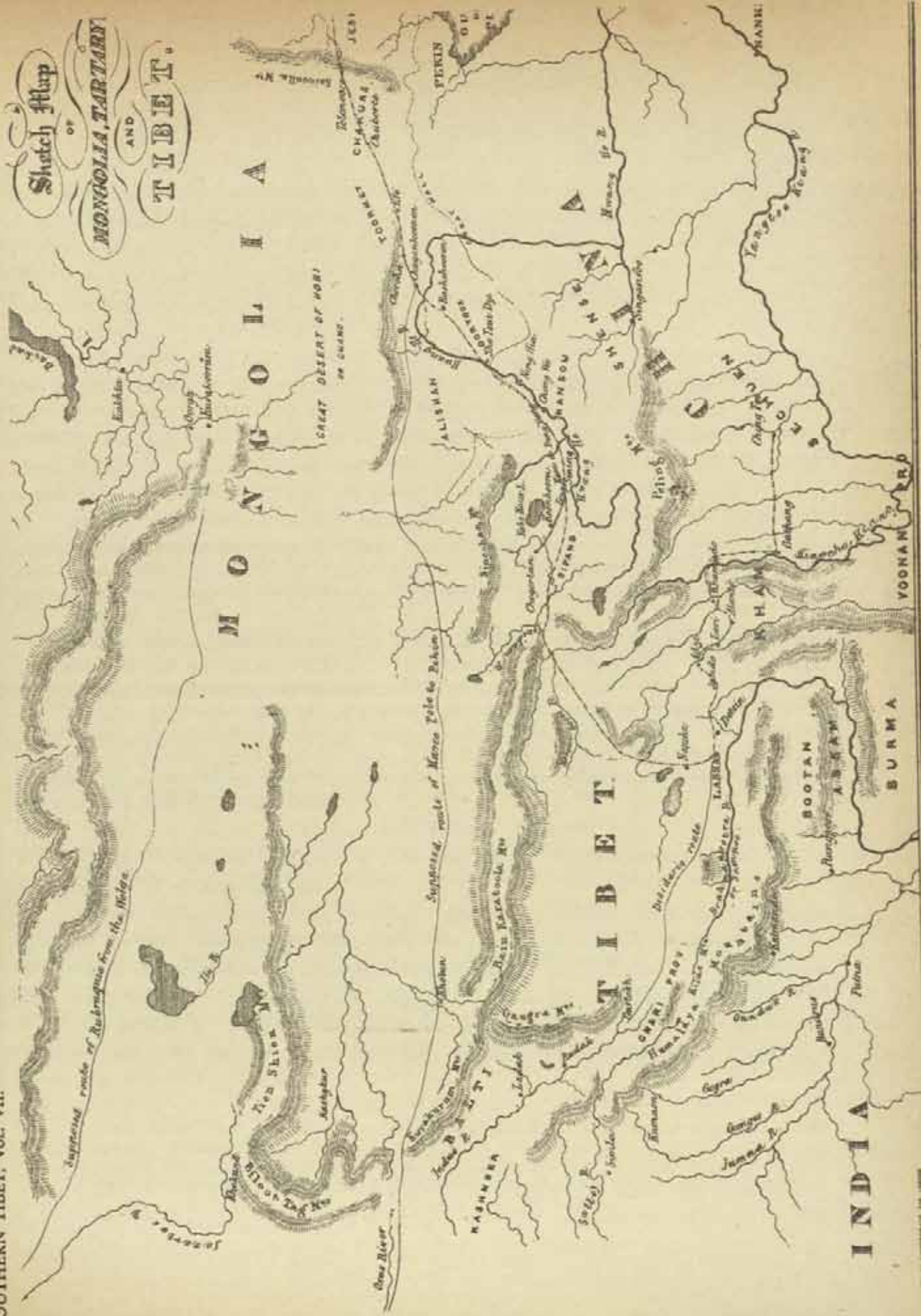
¹ *Himalayan Journals, etc.* London 1854. Vol. II, p. 177.

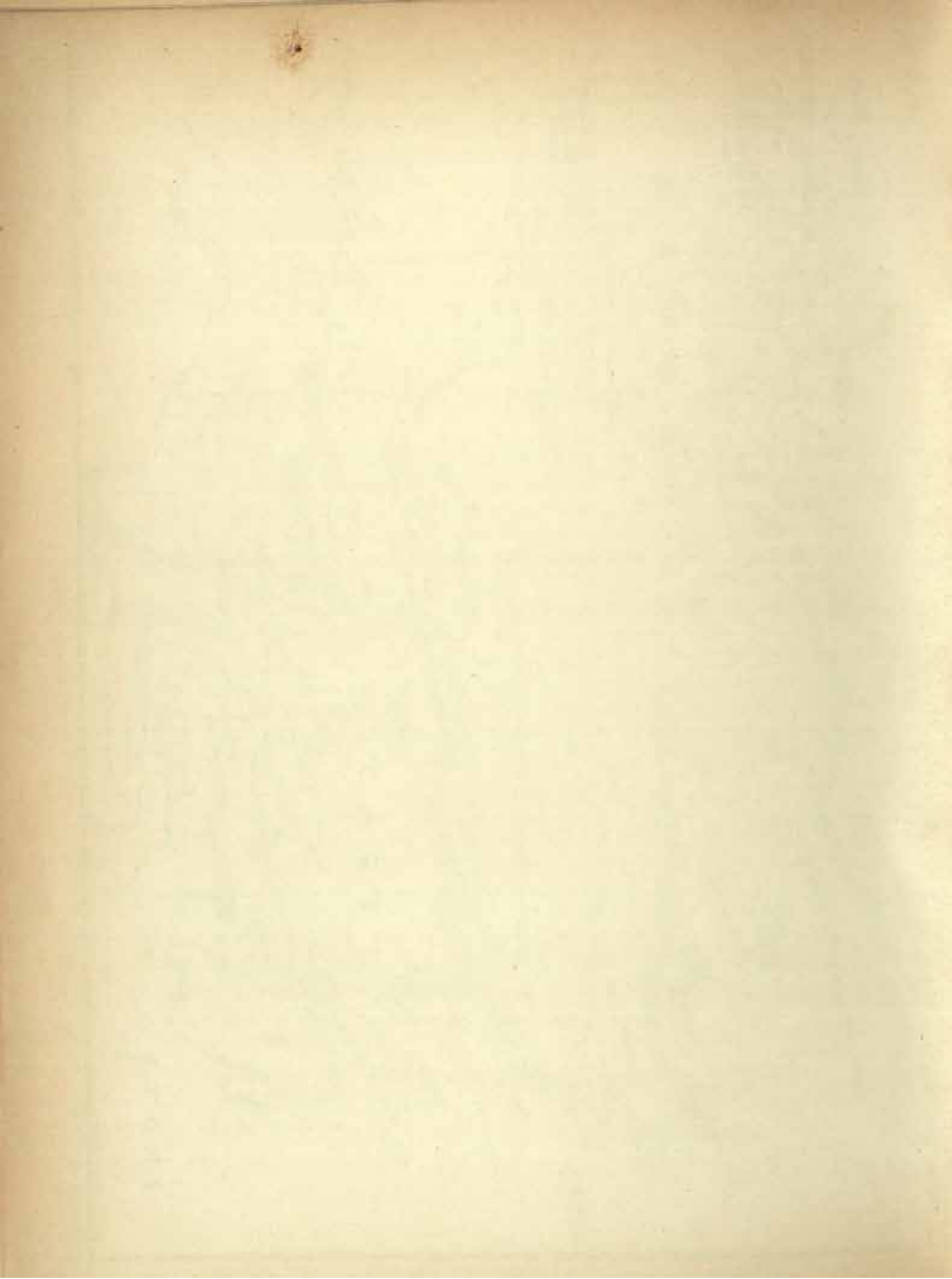
² *Op. cit.*, p. 396.

³ *Vide* Vol. III, p. 113 *et seq.*

⁴ *Op. cit.*, p. 400.

Sketch Map
OF
MONGOLIA, TARTARY
AND
TIBET.





In a little book published in 1851, HENRY T. PRINSEP gives a general view of the then existing knowledge of Tibet.¹ It is only a compilation from ancient and modern travellers, especially from HUC'S book. Of some interest is his little sketch map where Eastern Turkestan is bordered in the west by the Biloot Tag Mts., to the S. W. by the Kurakurum Mts. and to the south by the Bain Karatoola (Bayen Kharat in the text). The Tibetan plateau is bordered to the west by the Gangra Mts., which start as a nearly meridional range from the Kurakurum Mts.—Bain Karatoola range, or, in reality, the Kuen-lun.

DESIDERI'S route is marked a good long way north of the »Sampoo», but this is chiefly due to the ignorance of the mapmaker regarding the situation of Gartok. I have inserted a reprint of PRINSEP'S little map (Pl. XLVII) only as a curiosity, showing what liberties certain draftsmen could allow themselves at a time when RITTER'S and KLAPROTH'S excellent maps were 18 and 15 years old, and ought to have been consulted by people writing books about Tibet.

In 1851 RICHARD STRACHEY wrote about the elevated region called Tibet that: we are familiar with the mountains that abut upon, and indeed form its southern edge, as the Himalaya; while there seems every reason to suppose that the chain that appears upon our maps as the Kouenlun in like manner forms its termination to the north.

And he adds that:

it appears to be with few exceptions broken up into a mass of mountain, the average elevation of whose surface is very great, often exceeding in altitude 15,000 feet It is the opinion of my brother Captain Henry Strachey that neither the Kouenlun, nor the Himalaya, as marked upon our maps, have any definite special existence as mountain-chains apart from the general elevated mass of Tibet. That rugged country thus seems to form the summit of a great protuberance, above the general level of the earth's surface, of which these two chains form the north and south faces. All my own observations lead me to concur entirely in this opinion.²

Thereby it should be noticed that Richard Strachey means our real Karakorum when he talks of Kwen-lun, a fact that makes his opinion wrong so far as the northern front is concerned.

HENRY STRACHEY relates that the region lying behind the Indian Himalaya is a belt of high mountainous table land, »narrow compared with its length, and to the best of our imperfect knowledge subsiding on its N. E. border, into the plains and sandy deserts of Turkistan and Khamsok. This part of Tibet is called Bod, *i. e.* Tibet proper, or Central Tibet, at its E. end and Nari at its N. W., the former division being the shorter of the two, but probably the broader, and certainly the more populous and civilized.»³

¹ *Tibet, Tartary and Mongolia; their Social and Political condition, and the religion of Boodh, as there existing.* London 1851.

² *Journal Royal Geographical Society.* Vol. 21, 1851, p. 58.

³ *Physical Geography of Western Tibet. Journal Royal Geographical Society.* Vol. 23, 1853, p. 3.

He supposes that the great mountainous mass of the Tibetan table-land and Himalaya is continued till it ends abruptly about 40° North. lat. in Bulut Tag in the very centre of Turkestan.¹ He gives a very good *résumé* of what we know from the journeys of MOORCROFT and HEARSAY, himself and his brother and WINTERBOTTOM. This is not much, »but we have obtained a distinct though distant view of the mountains in this quarter as far as E. long. 82° ; and native information regarding the remaining corner to the S. E. has been tolerably precise». After VIGNE he mentions the explorations of Lieut. R. YOUNG, J. E. WINTERBOTTOM and P. VANS AGNEW in 1847, extending to $35^{\circ} 50'$ north, in the valley of Haramosh and in other valleys farther west. Henry Strachey himself reached the eastern head of the Chang-chenmo »without attaining any knowledge of a Turkish watershed».

Regarding the names of peaks and ranges, Henry Strachey writes the wise words:

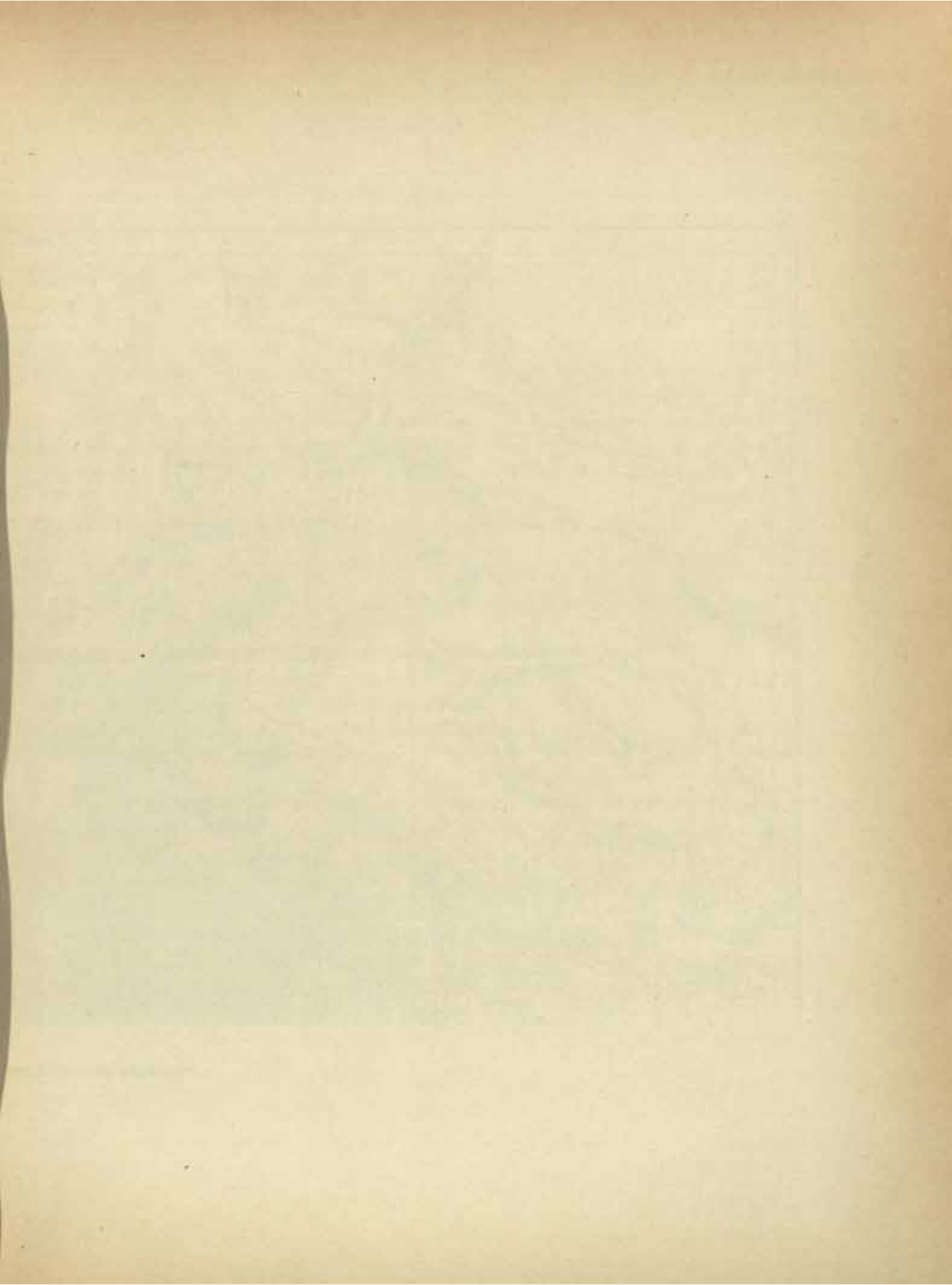
The Tibetans have proper names for a few remarkable peaks and for all of the passes, but no general name for whole ranges; and when such appear upon our maps they are the misapplication of purely local names by English surveyors and European geographers. Thus.... the Turkish Mus-Tag, *i. e.* Ice-Berg, and Kara-korum, *i. e.* Black Gravel, applied by the natives exclusively to the mere passes, and the Indian Kailash to a mere peak, have been raised to that wrong eminence upon the map of Asia.²

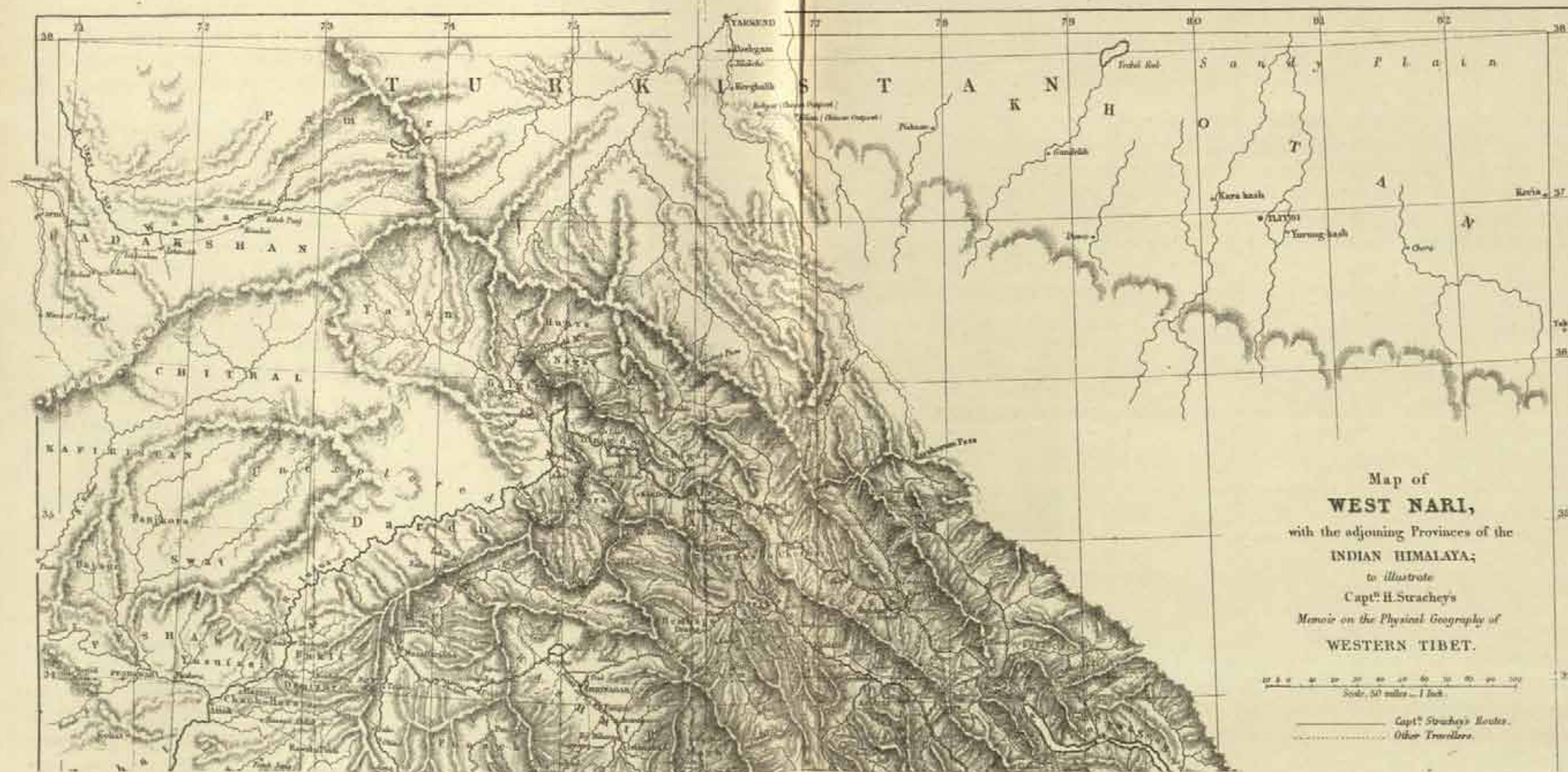
This observation is quite correct. But still such names are absolutely necessary by want of any better. There is, however, a great difference between the three names mentioned by H. Strachey as examples. For »Mus-tagh» are always the highest mountains, *viz.* such that give rise to glaciers, as, for instance, Mus-tagh-ata. Kara-korum is the name of one single pass; but as the most important road through Western Tibet crosses it, it has become more famous than any other pass in these regions, and is known by whole nations. Kailas, on the other hand, is an Indian name belonging only to one special peak. The appellation Kailas Range, as CUNNINGHAM has it, is quite superfluous.

Henry Strachey regarded the mountain system of Western Tibet as consisting of a series of parallel ranges running right across the breadth of the table-land in a direction so extremely oblique to the general extension of the whole as often to confound the one with the other, or to convert the transverse direction to a longitudinal one. The supposed primary arrangement would be converted into the existing varieties of valley and drainage by short transverse necks connecting the main ranges in some parts, fissures cutting through them, and projecting spurs of a secondary order. The connecting necks may be confounded with the main ranges. Secondary spurs also may be so high and so obliquely joined to the primary ranges as to make it difficult to distinguish between the two. Strachey believes that much of the

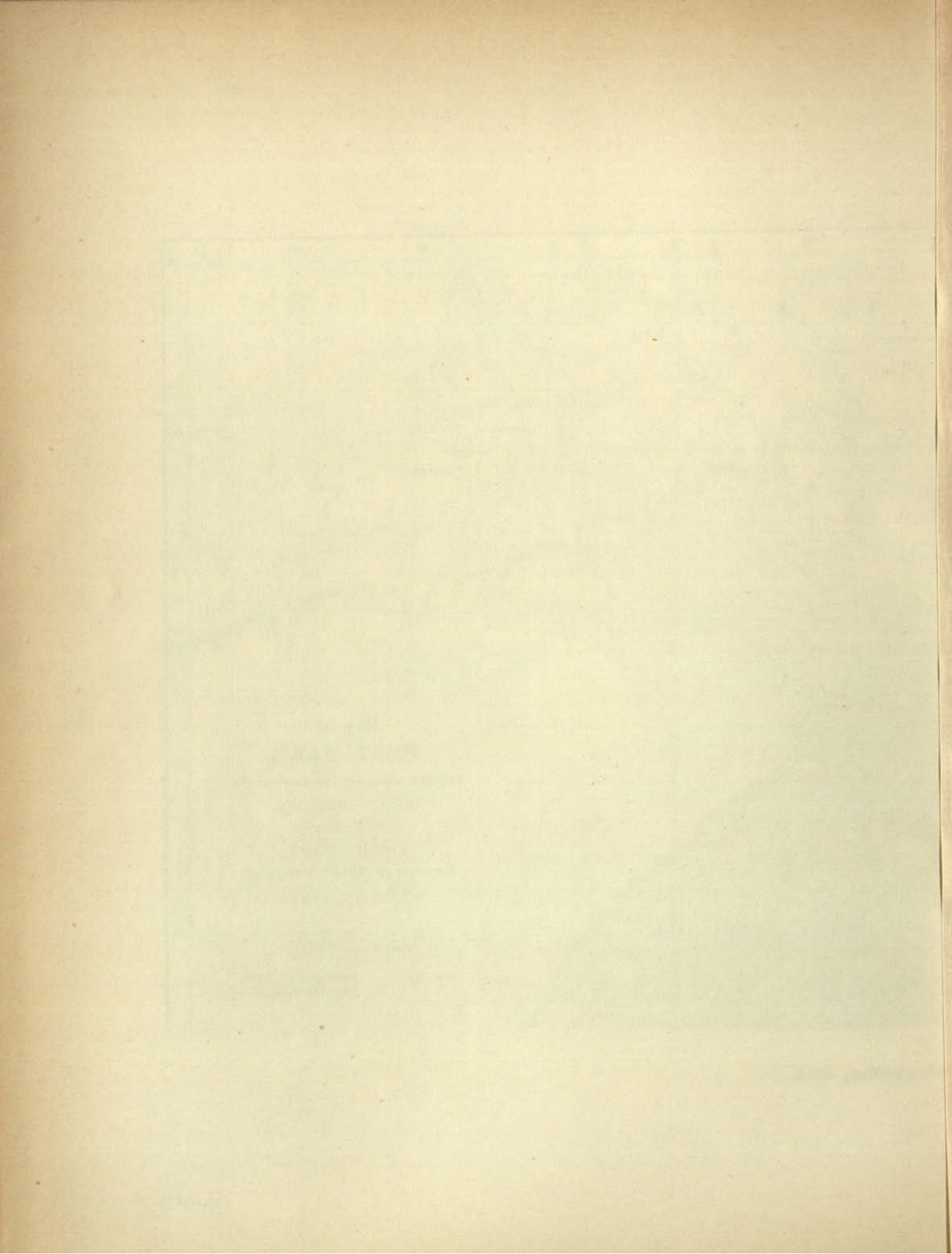
¹ *Ibidem*, p. 5.

² *Loc. cit.*, p. 26.





Northern part of Henry Strachey's Map, 1853.



Indian watershed is formed in this way. The Tibetan passes are crossing the low connecting links, whose alignment forms the main watershed but not the main mountain crest. From what he knows of the Turkish watershed, he supposes that the same formation exists there also.¹

He regards the northern Indus as rising at once with a considerable body of water from the glaciers of Kumdan. As so many geographers of his time, he makes the Kumdan glaciers responsible for the great cataclysms of the Indus in 1835 and 1839.

Remembering the very scanty material existing in these days it is not surprising that Strachey could pay so little attention to the Kara-korum System. His own exploration was farther south, and when even the single Englishman who had reached the Kara-korum Pass reckoned it to the Kwen-lun, Strachey had no direct cause to believe in the existence of a third tremendous system between the Himalaya and the Kwen-lun. Regarding the glaciers of Western Tibet he expresses his opinion in the following correct words:

The chief reservoirs of Tibetan glaciers seem to be in the S. face of the Turkish watershed, which the joint observations of English travellers and native reports prove to be full of them, and many of the first class both for size and formation. The main trunk of the Nubra River issues from two of these, at a place called Kumdan.

I myself found the river of Yarma-Nubra issuing fullformed (being 50 yards wide, with an extreme depth of $1\frac{1}{2}$ feet, and very rapid, in the beginning of October) from a large glacier, entirely occupying the head of the valley and (so far as Tibetan information goes) rendering it impassable.

The Tulumbuti affluent of the Yarma-Nubra River also rises from glaciers, which are passed on the summer road to Yarkend, upon the S. W. of the Saser La (as mentioned by Dr. Thomson). Mr. Vigne found several glaciers in the Shigar and Khapalu valleys, aligning with those of Kumdan and Yarma-Nubra; and the native travellers between Yarkend and Balti testify to a very large one upon the Turkish watershed, at the head of the Braldo branch of Shigar, which forms a serious obstacle to this route, and gives the pass its Turkish name of Mustag, *i. e.* Iceberg. Mr. J. E. Winterbottom and Lieut. R. Young found another still farther to the N. W., beyond the Tibetan frontier, in the northern head of Gilgit.²

Henry Strachey's article quoted above may certainly be said to be the best monograph ever written on the physical geography of Western Tibet until his time. It is full of detailed personal observation, and the material is arranged in the most conscientious way, and with the greatest clear-sightedness and penetration. The map accompanying his paper,³ and of which Pl. XLVIII is the northern half, is quite worthy of the erudite text. In accordance with the latter he has desisted from entering any

¹ Loc. cit., p. 23.

² Loc. cit., p. 53.

³ *Map of West Nari, with the adjoining Provinces of the Indian Himalaya, to Illustrate Capt. H. Strachey's Memoir on the Physical Geography of Western Tibet.*

names at all on the mountain ranges. Even the name of Himalaya is missing, by which he probably wishes to point out that this name has rather a poetical and religious sense and is nearly unknown to the *profanum vulgus*. There is no Kwenlun and no Kara-korum Range, only the Kara-korum Pass situated in a range which has nearly the same form as on the maps of WALKER and THOMSON. The range with the Mustagh Pass, being the High Kara-korum, and with the word Glacier entered at some places, is connected with the range where the Shayok and Nubra have their sources. The High Kara-korum continues to the N. W. straight through Pamir. The real Kwenlun is hardly indicated.

Of some interest is the Narrative of the Travels of Khwajah (Khoja) AHMED SHAH NUKSHBUNDI SYUD who started from Kashmir on the 28th of October, 1852, and went through Yarkand, Kokan, Bokhara and Kabul, in search of Mr. WYBURD.¹ Ahmed Shah who left Kashmir at the above date, went first to Leh, where he remained for a month and 18 days, awaiting the arrival of a caravan and making preparations for his journey to Yarkand. The report of his journey is written by himself and communicated by the Government of India.

On January 7th, 1853, he left Leh for Yarkand, »the road to which is through a rocky barren country, and through defiles». The following is what he observed: »From Ladak to Lamakut is five days' journey. Lamakut is a haltingplace with a few huts. A fordable stream coming down from the direction of Ladak flows past Lamakut. From there to Ak Musjid is 30 marches. The country is totally uninhabited. The Kurra Koorum Mountains have to be crossed on the road. There are two roads, known as the Maryhan and Ekdan; the former is the summer road. There are three passes on this line.» The tract between the Kurra Koorum Range and Lamakut, a distance of three days' journey, is called Dubsun, which, during winter, is blocked up with snow, rendering this road impassable. The Ekdan (snow) or winter way was, according to the people of those parts, blocked up for 22 years, and water accumulating above it caused the snow at last to give away and they say that this was the cause of the great flood of the Indus in 1840. This is the route almost always now followed by the Kufilahs, and is two marches shorter than the other.»

He found the »snow» melting at some distance from the ground, leaving masses in the shape of large trees, from which hung icicles, and between which he moved along. He believed himself wandering in the midst of a sea of crystal. On the top of the snow were large rocks and stones of a red and white colour. To cross this sort of country took him half a day. »The Kurra Koorum is a small mountain, but when a wind, which is known as the sootuk, blows, the air becomes

¹ *Journal Asiatic Society of Bengal*. Vol. XXV, 1856, p. 344 *et seq.*

very rarified, and breathing becomes difficult.» In the spring there are heavy snow falls often obliging caravans to return. The sootuk often kills the horses. »From the Kurra Korum to the Akhtab mountains a journey of three days, there is no water on the road,.... the road traverses a pass through the Akhtab mountains, through which there are two roads, the Kullian and the Kookrai.... It takes some six or seven days to get through the Kullian, after which four days' march brings you to Kurgulluk....»¹

From this short report one could hardly suspect the existence of another great mountain system north of the one in which the Kara-korum Pass is situated. Ahmed Shah's Ekdan route is obviously the Kumdan one which he found blocked up by snow, *i. e.* glacier ice, by which a lake was formed above the glacier. So it remained from 1818 to 1840.

He crossed the very glacier, as seems from his description of the ice, and the passage took him half a day. Thus the road must have been rather difficult unless the Chong Kumdan is also included. In 1840 the road seems to have been cleared. He especially says that »this is the route almost always now followed by the caravans», from which it appears as if the road was passable from 1840 until the winter 1852—1853. But as Ahmed Shah had to cross the glacier snout, this must have, during the last years of the said period, advanced to the opposite mountain wall and again closed the valley.

His description would also suit the state of things which I found in 1902, exactly 50 years later.² The snout then did not reach the mountain foot, but the great blocks of ice fallen by melting from the snout totally filled up the intermediate space. But to judge from his description, and as he found large rocks (great blocks) and stones on the top of the snow (on the glacier), it seems more likely, that the road in 1852—53 really had to cross the very end of the glacier, which took half a day to accomplish. The fact that the road was made open in 1840 does not prove that the action of the glacier was diminished, only that the accumulated lake was then heavy enough to break away the snout. As soon as the passage had been cleared the glacier began to advance again, until it finally, in 1852—1853 had blocked the road.

In an article by Lieut. H. G. RAVERTY *Notes on Kokán, Kashgár, Yárkand, and other places in Central Asia*,³ we find the following mention of the Kara-korum road:

There are two routes from Kashmir to Yárkand and Kokán. The most direct one is by way of Iskárdoh and along the banks of the Shighun river, and over the Mus-ták

¹ Kilian, Koksai and Karghalik.

² *Cp.* Vol. II, p. 193 *et seq.*

³ *Journal Asiatic Society of Bengal.* Vol. XXVI, 1857, p. 265.

range of mountains by the Hanzi pass. The other, a more round-about road, is by way of Leh or Ladákh, through the valley of the Shai Yak¹, as the northern branch of the Indus is named, and over the Karah Korrum mountains, which appears to have been the route followed by the Sayed (Ahmed Shah). There is another route from Leh to the Karah Korrum range, further to the west by way of Nubra, but it is only used when the Shai Yak is too deep to be crossed. The route by Iskárdoh is less than the other by ten stages, but it is only open from the middle of April to the end of October, whilst the Leh route is practicable, though difficult, for the greater part of the year.

Raverty distinguishes between the Mus-tagh range of mountains and the Karakorum Mountains, and has also the term Kara-korum Range for the latter.

T. G. MONTGOMERIE, the greatest authority of his time on Western Tibet, also talks of the Mus-tagh and the Kara-korum as two different ranges, although he may have meant two different parts of one and the same system. In his *Memorandum on the Nanga Parbat*,² he writes: »During my three days' residence on the snowy mountain Haramook, at upwards of 16,000 feet above the sea, I had several fine views of the Karakoram range and of the ranges to the north of the Indus. Amongst others two very fine peaks were visible beyond the general outline of the Mustagh and Karakoram range.»

At the end of STANISLAS JULIEN'S *Mémoires* (1857) VIVIEN DE SAINT-MARTIN has published an excellent map illustrating HSÜAN-CHUANG'S journeys. In his text³ to this map he gives a list of the material he has used for compiling it.⁴ For the N. W. confines of China and for Tartary, Vivien de Saint-Martin has used the great map of Central Asia drawn in four sheets by KLAPROTH, 1833, of which he says: Cette belle carte est une réduction des atlas chinois, assujettis aux observations astronomiques des missionnaires chargées par l'empereur Kien-long d'établir la carte générale de l'empire . . . For the parts N. W. of Himalaya he has chiefly used the map of WALKER in CUNNINGHAM'S *Ladak*. As the material in his time was insufficient, it is not surprising that Vivien de Saint-Martin has placed the Kwen-lun, which he calls Chaîne des Monts Thsoug-ling, too far south (Pl. XLIX). But if we examine his map a little closer we find that the Thsoug-ling is not at all meant to be what we call Kwen-lun, but the Kara-korum Range, as it was known in these days. This is proved both by the latitude and the fact of its being the great continental water-parting. The Tsung-ling is here shown as continuing to the N. W. all the way to a point west of Kashgar, including the Pamir which, in 1857, was extremely little known. From the Pamir the Hindu-kush stretches to the S. W. as a very mighty range. On HEINRICH KIEPERT'S map of the same year we find the range with the continental

¹ Shayok.

² *Journal Asiatic Society of Bengal*. Vol. XXVI, 1857, p. 266.

³ *Mémoire analytique sur la Carte de l'Asie Centrale et de l'Inde, construite d'après le Si-yu-ki*. . .

⁴ The title of the map is: *L'Asie Centrale et l'Inde au septième siècle de notre ère pour l'intelligence des Voyages de Hiouen-thsang avec un mémoire analytique par M. Vivien de Saint-Martin* 1857.



Karte der Britischen Besitzungen in Ost-Indien. Aus Heinrich Kiepert's
Neuem Handatlas. No. 29. Berlin 1857.

water-parting and the Kara-korum Pass identified with the »Tsung-ling (chin. Blaues Geb.) Muz-Tagh (türk. Eis Geb.)». The Great Kara-korum with the glaciers is practically missing on this map.¹

Recapitulating the different views set forth in this chapter, we have seen that HOOKER regards the Kara-korum or Kwen-lun as the great continental water-parting, a view that in later years was proved to be correct. Further, he believes that the Mus-tagh or Kara-korum extends due east into China south of the Hwang-ho. This theory is very interesting, and could be created only by a man of Hooker's perspicacity and intelligence. Ordinary explorers never see so far. In the history of exploration in the Kara-korum one very rarely meets the statement that the Kara-korum continues through the whole of the Tibetan plateau-land. Hooker even goes too far, for already before reaching so far as to the region south of the sources of the Hwang-ho, the northern Kara-korum System, or Tang-la, has turned to the S. E. and south in its magnificent bend parallel to the Indo-Chinese rivers. However, according to Hooker, though he does not say it, the eastern continuation of the Kara-korum-Mus-tagh, *i. e.* the Tang-la, has been crossed by HUC and GABET. Following HUMBOLDT as a leader he reckons the Kara-korum to the Kwen-lun System.

RICHARD STRACHEY looks upon Tibet as a great mountain mass, or protuberance, the Himalaya and Kwen-lun being integrating parts of it, a view that of course may be said to have something in its favour. But hereby we should not forget that Richard Strachey in speaking of the Kwen-lun means the Kara-korum, and the latter, as soon became known, does not terminate the protuberance to the north. The system we are used to calling Kwen-lun still remained to be discovered.

In HENRY STRACHEY'S opinion a table-land extended north of the Himalaya, slowly falling to the N. E. and gradually emerging into the deserts of Eastern Turkestan. To the N. W. the Bulut-tagh was a natural boundary to the Tibetan table-land. The great ranges he regarded as situated on the table-land, crossing it fairly parallel with one another, and in a very oblique direction. To him the Kara-korum and Kwen-lun were one and the same system, and as the Kara-korum was not known to continue very far east or S. E., it is easy to understand his idea about the slowly falling plateau-land to the N. E. He was the first to explore the middle course of the Chang-chenmo.

AHMED SHAH speaks of the Kurra Koorum Mountains, not only of the pass. But saying it is a small mountain, he probably only means the relatively low crest north of Yapchan, in which the saddle of the pass is sunk. He does not mention the mountains we call Kwen-lun.

¹ Pl. L. The title of the map is *Karte der Britischen Besitzungen in Ost-Indien . . .* aus Heinrich Kiepert's *Neuem Handatlas* No. 29, 1:8000000. Berlin 1857.

Both RAVERTY and MONTGOMERIE speak of the Mus-tagh and the Kara-korum as two different ranges. The latter, one of the most perspicacious and enterprising specialists of these inaccessible tracts, regards the Kara-korum as a well developed mountain system of very great orographical importance, and does by no means confound it with the Kwen-lun.

However, the exploration in the Kara-korum was still at its threshold. When J. P. FERRIER complains of the unreliability of the maps of regions situated much farther west, one could, at this time, hardly speak of any maps at all from Western Tibet.¹

¹ On a pu remarquer dans le cours de ce journal diverses annotations propres à servir à la rectification des cartes d'Asie qui existent actuellement. Il y en a peu ou point d'exactes. Des rivières et des lacs ont été omis. Le cours des autres est mal tracé. Des districts entiers, regardés comme déserts, sont au contraire fertiles et très-peuplés. . . . *Voyages en Perse, dans l'Afghanistan, le Béloutchistan et le Turkestan*. Paris 1860. Tome II, p. 383.

CHAPTER XXV.

THE VERACITY OF HUC.—LASSEN.

The famous names of HUC and GABET have just been mentioned. In Vol. III, p. 158, I have discussed their journey in so far as it is in contact with the Trans-himalaya. Here, therefore, only a few words need to be added.

Huc always has his eyes open for the inhabitants and tells all his personal experiences, but very seldom has anything of geographical value to say. Only as a matter of small importance he sometimes mentions the mountains of Tibet. Thus he says: *Le Tibet, presque entièrement recouvert de montagnes et sillonné de torrents impétueux, fournit à ses habitants peu de terre cultivable; il n'est guère que les vallées qu'on puisse ensemer avec quelque espérance d'avoir une moisson à recueillir.* — We should not forget that Huc in speaking of Tibet, only means the southern parts of that country, from the district where inhabitants begin to appear, *i. e.* from Nakchu.¹

He speaks of the deserts of Tartary when travelling westwards and tells us that he had no other means to determine his whereabouts than a compass and the map of the Chinese Empire drawn by Andriveau Goujon.

Samdadchiemba n'était pas plus instruit que nous des routes de la Tartarie. Nous nous enfonçâmes dans les déserts, ayant pour seuls guides une boussole et l'excellente carte de l'empire chinois de l'Atlas de M. Andriveau Goujon.

Only very shortly Huc describes the most difficult part of his journey, the crossing of the »vast chain of the Tanla Mountains«, and the dangers and difficulties associated with it. It had been said that all the sick people of the caravan, amongst others P. Gabet, would die and the strong ones have to endure a hard crisis. After six days' arduous ascent the travellers arrived at the height of »this famous plateau«, which was supposed to be the highest place of the globe. »Nous voyageâmes pendant douze jours sur les hauteurs du Tanla.« The weather was very good. The descent took four days.

¹ *Voyage dans l'intérieur du Tibet, Relation du séjour à Lha'ssa 1846. Nouv. Annales des voyages, 1849. Tome premier, p. 144.*

Of some interest is his description of the hot springs, a phenomenon that also occurs in several places of the Kara-korum.

Parmi d'énormes rochers on voyait comme de grands réservoirs où l'eau bouillonnait avec violence. Quelquefois elle jaillissait en colonne comme si elle fût sortie d'un corps de pompe. Au-dessous de ces grandes sources, des vapeurs épaisses s'élevaient dans les airs et se condensaient en nuages. Ces eaux sont sulfureuses. Les malades tibétains s'y rendent quelquefois de fort loin pour prendre des bains.¹

In his book Huc gives a more detailed description of the hot springs.

Quand nous fûmes arrivés au bas, nous rencontrâmes des sources d'eau thermale, d'une extrême magnificence. On voyait, parmi d'énormes rochers, un grand nombre de réservoirs creusés par la nature, où l'eau bouillonnait comme dans de grandes chaudières placées sur un feu très-actif. Quelquefois, elle s'échappait à travers les fissures des rochers, et s'élançait dans toutes les directions par une foule de petits jets bizarres et capricieux. Souvent l'ébullition devenait tout à coup si violente, au milieu de certains réservoirs, que de grandes colonnes d'eau montaient et retombaient avec intermittence, comme si elles eussent été poussées par un immense corps de pompe. Au-dessus de ces sources, des vapeurs épaisses s'élevaient continuellement dans les airs, et se condensaient en nuages blanchâtres. Toutes ces eaux étaient sulfureuses. Après avoir longtemps bondi et rebondi dans leurs vastes réservoirs de granit, elles abandonnaient enfin ces roches, qui semblaient vouloir les retenir captives, et allaient se réunir dans une petite vallée où elles formaient un large ruisseau qui s'écoulait sur un lit de cailloux jaunes comme de l'or.²

PRISHEVALSKIY also describes these springs. They are situated at the southern side of Tang-la, along the river Tan-chu, and are to be found at two different places, separated from each other by a distance of 13 versts. The upper springs had a temperature $+32.0^{\circ}$ C., the lower $+52.0^{\circ}$. The latter occupy a belt of 100 sashen in length. »Here the springs are rather numerous. Two of them rise in the form of fountains being 3 or 4 feet high. The others either rise in small jets, or issue from the earth with a hissing sound, or boil in the tuff-beds themselves just as in a pot.» A little lower down, where the temperature was 19 or 20° C. algae were growing and fishes living, as usual *Nemachilus* and *Schizopygopsis*.³

If my theory is correct that both the Tang-la and the Nien-chen-tang-la are to be regarded as the eastern continuation of the Kara-korum System, HUC has crossed the whole eastern part of the system. The southern branch he calls Koïran, a name that he got from D'ANVILLE'S map or from DUFOUR, 1840.⁴ Of the passage

¹ *Voyage à travers la Mongolie et le Tibet, en 1844, 1845 et 1846* par M. Huc et Gabet. *Nouv. Annales des voyages* 1847. Tome III. Lettre de M. Huc, p. 155 et seq.

² *Souvenirs d'un voyage dans la Tartarie, le Tibet et la Chine*, Paris 1853. Tome II, p. 232.

³ *Изъ Зайсана черезъ Хаму въ Тибетъ и на верховья Желтой Рѣки*. С.-Петербургъ, 1883, p. 245.

⁴ Vol. III, p. 163, Pl. XVIII. — In another of his works *Le Christianisme en Chine, en Tartarie et en Thibet*, Paris, 1857, Huc has a fine little map drawn by P. BINETEAU, where the S. W. part of Eastern Turkestan directly borders upon a range called Bolor-tagh in its western part, and Thsounghing S. W. of Khotan. Only farther east the Kwen-lun comes in between this range and the deserts. Ladak fills up the whole intervening space between the Thsounghing and the Himalaya. The Trans-himalaya is influenced by HUMOLDT, and the name Koïran is missing.

of these mountains he hardly says anything else than that it was extremely difficult. Of the road south of Nakchu he says:

La station tibétaine la plus importante qu'on rencontre en allant à Lassa, est située sur les bords de la rivière Na-ptchu, désignée sur la carte par le nom mongol de Kharaoussou Les caravanes qui se rendent à Lassa doivent rester quelques jours dans ce pays (Nap-chu) pour organiser un nouveau système de transport. La difficulté des chemins ne permet pas aux chameaux d'aller plus loin. Nous vendîmes donc les nôtres et, après avoir loué des boeufs à long poil, nous continuâmes notre marche.¹

Very curious is the mistake HUC makes regarding MOORCROFT of whom he says that he had passed 12 years at Lhasa, and that the suspicions of the Chinese were awakened by the maps found in his baggage.² This is indirectly corroborated by the French missionary KRICK, who was murdered in the country of the Abors in 1854,³ who says that the prohibition of travelling in Tibet depends on the fear of the people that their country might become an English possession, as well as on the Chinese policy.⁴

I cannot leave Huc without adding here a few more proofs of his veracity to those already given in Vol. III, p. 158 *et seq.*

The learned and able Lazariste Father ARMAND DAVID has furnished an interesting defence of the journey of Father HUC. Thirty years after the journey of HUC and GABET he had the same guide as his confrères, the famous Sambdat-chiemda.

Il est inutile de noter que c'est avec empressement que nous questionnons notre Sambdatchiemda sur son aventureux voyage avec ses pères spirituels, et c'est avec grande satisfaction que nous l'entendons confirmer la narration, aux allures un peu poétiques, de notre confrère toulousain: tout y est vrai, hors quelques anachronismes sans importance,

¹ *Lettre de M. Huc, missionnaire Lazariste. . . Nouv. An. d. voyages*, 1847. Tome I, p. 186. *Cp. Souvenirs. . .* II, p. 238.

² Les cartes de géographie sont très redoutées dans ce pays, on en a une peur extrême, surtout depuis l'affaire d'un certain Anglais, nommé Moorcroft, qui s'était introduit à Lhassa, où il se faisait passer pour Kachemirien. Après y avoir séjourné pendant douze ans, il est repart; mais il a été assassiné sur la route de Ladak. Parmi ses effets on a trouvé une nombreuse collection de cartes de géographie et de dessins, qu'il avait composés pendant son séjour à Lhassa. Cet événement a rendu les autorités chinoises très-suspectes à ce sujet. Puisque vous autres vous ne faites pas des cartes de géographie, c'est bien; je vais rapporter au régent ce que vous m'avez dit. *Nouv. Ann. de voyages*, 1849. Tome III, p. 101. Dutreuil de Rhins makes the same mistake: Après ses voyages au Ladak, Moorcroft se rendit du Ngari à Lhassa où il résida douze ans. En revenant dans l'Inde, il fut assassiné et ses papiers furent, dit-on, confisqués par les Thibétains. *L'Asie Centrale*, Paris 1889, p. 62.

³ ADRIEN LAUNAY, *Histoire de la Mission du Thibet*. Tome premier. Paris. No year, but after 1901, p. 193 *et seq.*

⁴ Mais d'où vient cette interdiction de voyager au Tibet? Elle a d'abord pour motif la crainte de devenir une possession anglaise; car, pour les indigènes, tout Européen est un espion de la Compagnie. En second lieu, elle est imposée par la politique chinoise. Il paraît que l'empereur envoie tous les ans des injonctions extrêmement sévères contre tout étranger. La Chine dit au Tibet: Si tu enfreins mes ordres, tu seras puni! La Chine et le Tibet disent au Boutan: Tu es la clef du pays, si tu livres passage nous te ferons la guerre. Le Boutan dit aux chefs qui sont à la frontière: Gardez chacun le district qui vous est confié: vous en répondez sur votre tête et sur celle de vos enfants. — *Voyage au Tibet à travers le Boutan en 1853. Nouv. Ann. des voyages*. Tome XXXV. 1853, p. 202.

et quelques confessions d'histoire naturelle que, d'ordinaire, un homme de notre profession n'est pas censé connaître à fond.¹

The distinguished traveller NEY ELIAS who was more capable than anybody else to make a comparison between HUC and PRSHEVALSKIY, says:

Of former travellers Huc's route more nearly coincides with Captain Prshewalskiy's than any other that I am aware of, and in spite of the latter's rather severe criticism of that author, the foregoing account must, after making certain allowances for differences of ear, circumstances of travel, &c., be looked upon as confirmatory, rather than otherwise, of his story.²

Sir HENRY YULE in his *Observations préliminaires* to PRSHEVALSKIY'S book says: En effet les descriptions de l'habile prêtre français et du soldat russe, autant du moins qu'ils ont suivi les mêmes chemins, ont une concordance admirable. YULE, as NEY ELIAS, and RICHTHOFEN, examines all the points of criticism, and says of some of them that they are mistakes of PRSHEVALSKIY, of others that they do not contain any exaggerations, and, of the passage of the Murui-ussu: je ne vois rien qui montre l'impossibilité pour Huc de suivre la grande rivière après l'avoir traversée. But of course Yule is right in his opinion regarding Huc's want of geographical education: En somme, quelque mérite qu'ait eu l'abbé Huc pour faire des descriptions pittoresques, il n'avait aucune instruction scientifique et même il était dénué de ce sens géographique qui permet à un voyageur, même hors d'état d'employer des instruments pour faire des observations, de contribuer d'une façon importante aux progrès des connaissances géographiques.³

Finally Prince HENRI D'ORLÉANS has published a little book in which he defends Father HUC.⁴ When the Russian traveller tells us how he and his comrade PILTZOFF on the banks of Bukain-gol joked about Huc, the Prince of Orléans says:

Ces plaisanteries n'avaient peut-être pas beaucoup de raison d'être. Prjevalsky, qui, il est vrai, en était alors à son premier voyage, semble ignorer de quelle manière, dans ces contrées, le lit d'une rivière peut se changer en vingt ans. S'il vivait encore, il trouverait avec raison très déplacées les plaisanteries que nous pourrions faire sur la prétendue largeur du Tarim en amont d'Abdallah — fleuve que nous avons descendu jusqu'au Lob-Nor et que nous avons trouvé beaucoup moins large que du temps où Prjevalsky le visita.⁵

The French Prince pretends that the Russian Captain was envious of the simple missionary who had achieved more than himself, and he even brings forward the following grave charge, by which he makes himself guilty of the same fault as the one with which he accuses the Russian officer:

¹ *Journal d'un Voyage en Mongolie fait en 1866 par M. l'Abbé Armand David, Missionnaire de la Congrégation des Lazaristes, Correspondant du Muséum. Nouvelles Archives du Muséum, Bulletin. Première Partie, p. 75.*

² *On Capitain Prshewalskiy's Explorations in Mongolia and Northern Tibet, 1870—73. Proceedings Roy. Geogr. Soc. Vol. XVIII. London 1873, p. 76 et seq.*

³ *Mongolie et pays des Tangoutes. Paris 1880, p. XVI et seq.*

⁴ *Le Père Huc et ses critiques. Paris 1893.* — The same apology is also partly entered in *T'oung pao. Vol. IV, 1893, p. 115 et seq.,* under the title: *A propos du Père Huc.*

⁵ *Op. cit., p. 14.*

D'ailleurs, si Huc avait commis quelque omission, Prjevalsky serait certes un des voyageurs le moins en droit de lui en faire un reproche. Il arrive plus d'une fois au Russe de changer ou de supprimer des noms déjà connus, et cela volontairement, pour donner un caractère de découverte à certaines parties de son itinéraire.

The Prince of Orléans has forgotten the two most important certificates ever given to Huc and Gabet. Both are given by German professors. The one, KÖPPEN, dislikes him as he is a Catholic, but constantly quotes Huc as one of the most important authorities on Lamaism living when Köppen wrote his excellent work.¹ RICHTHOFEN, the other, shows that HUC had no sense for nature, but so much the more for humanity. The geographical information contained in his volumes is very small, but still of unusual interest on account of the until then nearly unknown route. He writes in the brilliant colours of an intellectual novelist. On the other hand, Richthofen tells us that GABET was the man who *made* the journey. Of HUC he says:

Er war der formgewandte Begleiter seines in der chinesischen, mongolischen und tibetischen Sprache äusserst geschickten Ordensbruders Gabet, welchem das Verdienst der erfolgreichen Ausführung der kühnen Reise vom oberen Liau-ho durch die Mongolei, das Ordos-Land, am Khukhu-nor vorüber, und über das Tangla-Gebirge nach Lassa, und von da über Tshing-tu-fu nach Canton gebührt. Leider besitzen wir von ihm keinen Bericht über dieselbe, da er bald starb. Ich gebe hier das mir persönlich mitgetheilte Urtheil derjenigen katholischen Missionare in China wieder, welche Huc und Gabet selbst kannten. Sie sind einstimmig im Ruhm von Gabet, erkennen aber Huc nicht viel mehr als das Verdienst einer gewandten Feder zu.²

The characteristic given by Richthofen is worth more than the whole little book of the Prince. It shows that the two missionaries complemented one another in the most splendid way, and it is untouched by personal sympathy and antipathy.

Finally we may note the following testimony given by Colonel MARK S. BELL. In a short description of the pilgrims' road to Lhasa gathered from native information, he says: »Huc has given an excellent account of it. Prejevalski has, I think, too hastily thrown discredit on the works of this talented Jesuit, to the pertinency of whose remarks, and to the accuracy of whose observations, whenever and wherever I have been able to test them, I desire to pay tribute.³

* * *

In his gigantic work *Indische Altertumskunde* which is dedicated to the Asiatic Society of Bengal, and more especially to Sir William Jones, H. T. Colebrooke,

¹ *Die Lamaische Hierarchie und Kirche.* Berlin 1859.

² *China*, I, p. 706. Cp. my Vol. III, p. 159 *et seq.* W. L. Heeley has no high opinion of Huc as a geographer: »Huc has no notion of geography at all, and we lose much precious information through his total want of interest in the subject. He took no notes of distances, of the direction of streams, and other matters which might furnish a geographer with data.» — *The Calcutta Review*. Vol. LIX. Calcutta, 1874, p. 141.

³ *The Great Central Asian Trade Route from Peking to Kashgaria.* *Proceedings R. G. S.* Vol. XII. 1890, p. 57 *et seq.*

H. H. Wilson, and J. Prinsep, Professor CHRISTIAN LASSEN of Bonn in his geographical introduction, enters upon the orography and hydrography of western High Asia, and he does it in a way that proves that he is master of every detail of the subject. The preface of the first edition is dated 1847, and that of the second edition, which is at my disposal, 1866. The discoveries made until 1866 are, therefore, taken into consideration. Many professional geographers of that time would have been glad if they had penetrated the complicated physical geography of these regions as well as Lassen has done.

In a preceding volume we have examined LASSEN'S views in so far as they have anything to do with the Transhimalaya.¹ I will now only quote a few passages where Lassen more particularly speaks of the regions in question.

Speaking of the plateau-land of Pamir, LASSEN quotes MARCO POLO and continues:

Diese Hochfläche setzt fort östlich nach den Quellen des Shajuk; im Norden erhebt sich die Kette Tsungling, welche östlicher Kuenlun oder Kulkun, nördlicher aber Belurtag genannt wird; im Südosten die Karakorum Kette, welche südöstlich streichend, die heiligen Indischen Alpanse und den Götterberg Kailâsa erreicht; im Südwesten derselben Hochebene steigt endlich der höchste Hindukoh um den 37. Breitengrad empor.... Der äusseren oder nördlichen Seite des Tsungling und Kuenlun entspringen die Flüsse vom Yarkiang, welche mit dem von Khoten aus dem Kuenlun verbunden ostwärts dem See Lop zufließen; der südlichen Seite des letzten Gebirges der Shajuk, welcher den Karakorum durchbricht und südwärts zum obren Indus strömt. Es ist also auch nach dem Laufe der Gewässer hier ein Mittelpunkt Asiens, sie strömen von hier aus dem Aralsee, dem See Lop und dem Indischen Meere zu. In dieser Bedeutsamkeit hat auch das Alterthum diese Gegend aufgefasst und Buddhistische Pilger haben viel früher als Europäische Reisende diese jetzt erst ganz beglaubigten Nachrichten: die Kenntniss ist aber auch viel älter und wird sich in der Indischen Kosmographie nachweisen lassen.²

Or, in other words, he regards the plateau-land of the Pamir as continuing to the sources of the Shayok, which is, of course, not at all in accordance with the reality we know nowadays. Belur-tag, Ts'ung-ling and Kwen-lun constitute one uninterrupted system which serves as the great continental water-parting. The Karakorum stretches S. E. to the Kailas, and is pierced by the Shayok which has its sources on the crest of the great water-parting range. This view is correct; it should only be remembered that the great water-parting itself also belongs to the Karakorum System. The same view is thus emphasized:

Wenig oberhalb Iskardu's erhält der Indus einen mächtigen Zufluss aus Norden, den Shajuk, welcher weit im Norden und wenigstens über 36° n. B. hinaus in der gletscherreichen Kette Kuenlun's entspringt und die Karakorum-Kette durchbricht....

¹ *Cp.* Vol. III, p. 171 *et seq.*

² *Indische Alterthumskunde* von Christian Lassen. Erster Band. Zweite verbesserte und sehr vermehrte Auflage. Leipzig, MDCCCLXVII.

from which we see that the High Kara-korum was known to exist, though it was called Kwen-lun, and that the great water-parting is removed too far to the north.¹

Lassen does not believe that the roads from India across our mountains to the interior of Asia have ever had any great importance:

Die Indischen Länder unter dem westlichen Himälaja, vorzüglich Kaschmir, haben durch Pässe mit Baltistan und Ladakh manche Verbindungswege, welche aber nie für den weiteren Verkehr von grosser Wichtigkeit gewesen zu sein scheinen; die Ursache wird die Schwierigkeit der weiteren Wege sein, sowohl des von Ladakh nach dem Chinesischen Turkistan, dem Lande der Serer, am Shajuk über den Karakorum, als desjenigen, welcher über Iskardu am Kandjut nach Badakshan führt. Wir können auf diesen Wegen keine grossen Verbindungen Indiens mit dem Norden suchen, namentlich keine Einwanderungen der Völker, obwohl man auch dieses geglaubt hat.

Regarding the boundaries of India on the Upper Indus, he says that they may be determined only in great features:

Es werden auch hier die äussersten Ketten sein: der Darda Himälaja im Norden Kashmirs bis an den Indus, auf dessen rechtem Ufer aber die Gränze unklar ist. Doch wird man nie die Gebiete von Iskardu und Ladakh oder sogar Lhasa mit Recht als Indisch bezeichnen dürfen, wie geschehen ist (Hügel); denn wenn eine höhere Kette als der Himälaja diese Länder von dem Norden trennen sollte, so bleibt der grosse Gegensatz, dass die Länder der Bhôta Plateau-Länder sind, Indien aber, wo es anfängt, sich schnell zur Ebene herabsenkt und seiner Hauptsache nach Niederung ist; der Himälaja bildet den äussersten Südrand des Hochlandes und scheidet dieses von dem ganz verschiedenen südlichen Lande, während die inneren Ketten Hochasiens nur verwandte Gebiete von einander trennen.²

Lassen has a feeling of *terra incognita* along the right bank of the Upper Indus. Even if there should exist a range north of the Himalaya and of greater height than it, Tibet would always remain a plateau-land carrying different ranges.

To the third volume of Lassen's work, H. KIEPERT has added a very beautiful map of India.³ Here we find a considerable range which from N. W. to S. E. carries the following names: Pamer, Thsung-ling, Karakorum Pass and Kuenlun Geb. S. W. of it and west of Nubra are more secondary ranges and ramifications, to the N. E. the mountain gradually decrease in height and importance, and therefore, very little is to be seen of the real Kwen-lun.

¹ Op. cit., p. 44.

² Op. cit., p. 47.

³ *A map of Ancient India with the Indian classical and principal modern names, to illustrate Prof. Lassen's Indian Antiquities drawn by Henry Kiepert, L. L. D. at Berlin 1853.*

CHAPTER XXVI.

HERMANN, ADOLPH AND ROBERT VON SCHLAGINTWEIT.

In the years 1854 to 1858 the three VON SCHLAGINTWEIT brothers undertook their important journeys in the western parts of High Asia, by which the Kara-korum problem entered in a quite new era. Here we have only to deal with the part of their exploration that lies between Ladak and Khotan.

It was the great merit of the Schlagintweit brothers to prove that the Kara-korum and the Kwen-lun were two entirely different mountain systems, that the Kara-korum Pass was not situated in the Kwen-lun, and that the Kara-korum System was only partly the watershed of the rivers going to Eastern Turkestan. They discovered that the Kara-korum was indeed not only a very mighty system, but could even be regarded as the backbone of High Asia between 95° and 73° East. long. The slight precipitation conceals the fact that the Kara-korum is the highest of the three systems. To the west the Kara-korum divides itself into two branches: the Hindu-kush and Bolor-tagh. In its eastern half, about 85° East. long., the Kara-korum also divides into two branches of almost the same height. These branches bound to the north and south a comparatively inconsiderable depression, the direction of which is parallel to the watershed of the system. The lakes Tengri-nor and Namur-nor are regarded as situated in this depression which is open to the east. This view could not possibly be correct as the materials from where such conclusions could be drawn did not exist, even in 1871 when the work was published.¹ As a matter of fact the Kara-korum does not branch off at all, as it is at least double the whole way. But it is interesting to see that Schlagintweit believed in an eastern continuation of the system so far as to 95° East. long.

Further, the brothers found that the rivers beginning from the Kara-korum and running north pierce through the Kwen-lun in the same way as do the rivers running south through the Himalaya. Yarkand-darya, Kara-kash, and Keriya-darya

¹ Hermann von Schlagintweit, *Reisen in Indien und Hochasien*. Band II: *Hochasien*. Jena 1871, p. 7.

are mentioned as examples. The ridges and peaks of the Kwen-lun were found to be much lower than those of the Kara-korum and Himalaya. The average height of the Kara-korum peaks was found to be somewhat lower than that of the Himalaya peaks, but the average height of the ridges and passes greater. Tibet proper was regarded as a latitudinal valley between the Dihong and Indus, the Himalaya and Kara-korum, whereas the Kwen-lun was situated outside of Tibet and south of it is a plateau with irregular mountains.

The name Mus-tagh belongs only to a little part of the water-parting range. The brothers thought the name Kara-korum should be used for the whole system, although it was given by the natives only to the Kara-korum Pass. They had the satisfaction to see this proposal generally accepted.¹ HERMANN VON SCHLAGINTWEIT is right in saying that the difference in the general character of Kara-korum and Himalaya can be given by comparing the passes leading over the ranges. As a rule British geographers prefer to compare the peaks, although the passes are at least as important. Hermann von Schlagintweit knew 21 passes over the Himalaya, 3 over the Kara-korum and 3 over the Kwen-lun. The Schlagintweits had actually measured only resp. two of the three Kara-korum and Kwen-lun passes. For the Chang-chenmo Pass, which ADOLPH SCHLAGINTWEIT crossed July 9th, 1857, and the Piriák Pass in the Kwen-lun, west of Kara-kash, which he crossed a few weeks later, were only estimated, and not used in the calculation of averages:

Himalaya — 17,800 feet,

Kara-korum — 18,700 feet,

Kwen-lun — 17,000 feet.

In 1872, that is to say after NAIN SING'S journey in the Tsangpo valley, HERMANN VON SCHLAGINTWEIT describes Tibet as the great longitudinal valley region which is situated between the »Main range of High Asia, Kara-korum» and Himalaya.² I have shown, and will show in a more detailed manner later on, that this view was in reality correct, although from Schlagintweit's point of view it was a mistake. For in spite of Nain Sing's journey he did not know of the existence of the Transhimalaya, and, indeed, Nain Sing had not given him any cause to suspect the existence of such a system. But he continued the Kara-korum hypothetically eastwards south of Tengri-nor, and here the correct moment so far comes in, that the Transhimalaya has, no doubt, to be regarded as a continuation of one of the Kara-korum Systems.

In the fourth volume of his great work Hermann von Schlagintweit tells us what he and his brothers saw with their own eyes of the Kara-korum.³ The journeys

¹ *Ibidem* p. 11.

² Op. cit., Band III. *Hochasien: II. Tibet; zwischen der Himálaya- und der Karakorum-Kette.* Jena 1872.

³ Op. cit., Band IV. *Hochasien: III. Ost-Turkestan und Umgebungen.* Jena 1880, p. 3 *et seq.*

of the brothers took place, as I have said before, in 1854—1858 and the description was published in 1880.¹ Therefore the author has used material conquered by other explorers in the meantime, and sometimes it is not clear in how far he has been influenced by their experiences. In the first volume of the *Results*, 1861, we find, however, a very good *résumé* of ADOLPH'S last journey and in Vol. III, 1863, all the roads travelled by the brothers. A few extracts from the narrative will give us an idea of the work of the German travellers.

Of the range and its name it is said:

Die bedeutendste Krümmung, welche die Karakorum-Kette Nubra entlang annimmt, mag dazu beigetragen haben, dass man etwas zögerte, diese Kette auch hier als die weit nach Osten sich fortziehende Hauptkette, wie wir zuerst sie definirten, anzunehmen, und nach unserem Vorschlage auf diese neue Kette im Allgemeinen den Namen des Passes »Karakorum« zu übertragen.

But he points out that on the map of Col. WALKER, 1868, the Kara-korum Range, so far as the map goes to the east, was represented as the main range, and that the name Kara-korum Range was used for it. HAYWARD also accepted the name, but SHAW would hardly recognize the main range itself.

Hermann von Schlagintweit describes Nubra as bounded to the north and east by the Kara-korum Range. He gives a very good description of the summer and winter roads to Yarkand *viâ* the Kara-korum Pass. It is superfluous to relate here the absolute heights he gives for the passes, as these heights are better known nowadays.

About the upper Shayok he says:²

Ober Gyápshan mündet ein starker seitlicher Zufluss ein, und der Weg führt nahe am unteren Ende eines gegen Westen liegenden Gletschers vorüber. Er ist der grösste in diesem Gebiete und wird Shayók-Gletscher genannt. Shaw bezeichnet dessen Ausfluss als den Beginn des Shayokflusses; doch nach den neuen Daten der Trig. Vermessung, die auf Hayward's Karte von 1870 eingetragen sind, wird, ebenso wie unsere Turkistáni-Begleiter es uns angegeben hatten, jener Fluss, welcher bei Dáulat Beg Ulde und von dort nach Gyápshan herab kömmt, als der obere Theil des Shayok bezeichnet.

July 24th, 1856, HERMANN and ROBERT SCHLAGINTWEIT left Leh, crossed the Kardong Pass and took the summer road *viâ* Saser to the Kara-korum Pass. The hot springs near Pangmíg were visited; the debris is granite, and granite *in situ* is to be found in the slopes around. Accompanied by nine men they travelled in disguise and crossed the Chang-lúng Pass. Then the Saser Pass (17,753 feet) was crossed, and this was the most difficult part of the road to Turkestan. From skeletons of dead ponies it was easy to see the road. Three days were spent on the pass in making observations. The snow line was found at 18,600 feet. »Kalk-Gesteine

¹ The scientific *Results* appeared already in 1861—1866, containing Tables of their different itineraries.

² Op. cit., p. 11.

treten auf hier oben, aber vorherrschend sind krystallinische geschichtete Gesteine, und der Kalk hat somit keine Wahrscheinlichkeit sedimentär zu sein.»

After a very detailed and careful examination of the pass they continued eastwards, August 4th. Next day they crossed the Shayok at Sultan Chúskun, where the Kirilab River enters from the east.¹ Then began the rise to the Dapsang plateau. Such plateaux, he says, are not rare on the southern side of the Kara-korum, but they are incomparably greater on the northern side of the water-parting line. »Das Dapsang-Plateau bildet die letzte Vorstufe des Kara-korum-Passes.»

From the map of the G. T. S. he concludes that the source of the Shayok is situated some 30 Engl. miles east of Dowlet Bek-öldi, and that it comes from the neighbourhood of K 23. This is, as we know, only a tributary. He calculates the snow line at 19,400 feet on the southern, and at 18,600 on the northern side of the Kara-korum Pass, and to the pass itself he gives 18,345 feet. It is situated in grey sedimentary slate. The source of the Kara-kash he places east and almost 1° south of the Kara-korum Pass. To the east-south-east he could see »snowy peaks of the Kara-korum Range of considerable height», and with *névée* and ice. From them the range seemed to make a sharp turn to the south.

He observed that the plateau form disappears entirely already at the edge of the southern foot of the Kwen-lun. The Kara-kash and Keriya-darya pierce the Kwen-lun in the same manner as do the Indus, Satlej and other rivers through the Himalaya. Der Nordabhang des Künlün ist ähnlich wie der Nordabhang des Himalaya — d. h. wie dessen Abdachung gegen Tibet im Gegensatze zu jener gegen Indien — viel flacher, und die mittlere Neigung vom Künlün-Kamme gegen die Depression im Norden ist geringer als vom Karakorum-Kamme gegen den Südfuss des Künlün.

The masses of sand he found in the region between the Kara-korum and Kwen-lun he attributes, not to decomposition and weathering, but to the extremely frequent and strong winds in connection with the dry climate. He goes so far as to believe that the sands of the Tarim deserts are blown all over the Kwen-lun and to the watershed of the Kara-korum Range. Only there the force of the north wind is broken.

August 11th they passed Malikshah-su and Ak-tagh-su and the Kisil-korum Pass (17,762 feet). This pass is described as situated in the Kisil-korum Range, which is a branch from the Kara-tagh Range. The next day they arrived at the great lake Aksái Chin, 16,620 feet, although I cannot make out what particular lake he means.

The height of the Kok-köl was found to be 15,010 feet and it was surrounded by slate and greenstone varieties.² The water of the lake was slightly brackish, but

¹ This way is the same that I took in 1908.

² H. SCHLAGINTWEIT describes the »Kiuk Kiöl» (Kok-köl) which HAYWARD did not see, although he was quite near it. He is surprised that Hayward, in spite of the official reports of the Schlagintweits,

a constant sinking of its surface was easy to observe. It was sinking, not on account of desiccation, but by the gradual erosion of the outflowing water. The highest beach-lines were found at 25½ feet above the present level. It is hard to see why the lake should be salt if it had an outlet, unless he means that this had been cut off in later years.

After the slate, gneiss and granite appeared, and then, beyond Bash-malgun in the Kara-kash valley, greenstone and porphyry. At Sumgal they left the Kara-kash valley and turned north to Ilchi-davan. East of it the guide knew another pass, Yurung-kash-davan, the same which JOHNSON calls Yangi-davan. Ilchi-davan (17,379 feet) was surrounded by the *névés* of the Sumgal glacier to the south, and the Búshia-glacier to the north. August 25th they continued to Bushia where the Bushia-darya falls into the Khotan-darya, which itself joins the Kara-kash 15 miles below Ilchi, all information which he must have got from his guides. He adopts the division in Western and Eastern Kwen-lun, and he regards the Kwen-lun as the fourth range on the earth, considerably lower than the Kara-korum and Himalaya, but coming near the Andes.

August 29th, 1856, they went down the Kara-kash to its junction with the Suget River. On both sides of the Kara-kash valley, gneiss and mica slate was found. The Suget Pass is given as 17,683 feet high. September 4th they again crossed the Kara-korum Pass and returned to Leh the same way as before.

After having accomplished this journey the Schlagintweit brothers wrote:

We are fortunate enough to have been the first Europeans that ever crossed the chains of the Karakorum and of the Kuenlúen; Dr. Thomson had proceeded so far as to reach the Karakorum pass, but the Kuenlúen, erroneously considered as the watershed between Central Asia and India, had hitherto remained a perfectly unknown and unvisited territory, Marco Polo, in the 13th century, only penetrated in these parts as far south as Kashgar.¹

At another place Hermann says: Als geographisch neu hatte sich ergeben, dass die Karakorum-Kette als die wasserscheidende Linie entgegentritt. Nach Norden, hatte man geglaubt, sei die Grenze des indisch-tibetischen Stromgebietes erst durch die Kette des Künlün gebildet, den übrigens damals kein Europäer, weder vom

printed in the *Journal of the Asiatic Society of Bengal*, never mentions their journeys and discoveries, nor does he know the volumes of their *Results* which were published before 1866.

¹ *Results of a Scientific Mission to India and High Asia, undertaken between the years MDCCCLIV and MDCCCLVIII, by order of the Court of Directors of the Honourable East India Company, by Hermann, Adolph, and Robert de Schlagintweit, with an Atlas of Panoramas, Views and Maps.* Vol. I, Leipzig and London MDCCCLXI, p. 25. — This Vol. contains astronomical and magnetic observations. — Vol. II, 1862, has the title *General Hypsometry of India, the Himalaya, and Western Tibet with sections across the Chains of the Karakorum and Kuenlúen.* — Vol. III, 1863, *Route-Book of the Western parts of the Himalaya, Tibet, and Central Asia; and Geographical Glossary from the languages of India and Tibet.* — Vol. IV, 1866: *Meteorology of India.* — Four big portfolios with panoramas, diagrams, views and a few maps illustrate this gigantic work.

Norden noch vom Süden her, erreicht hatte. — Die Karakorúm-Kette, die früher auf den Karten ganz fehlte, ergab sich bei unserem Ueberschreiten des Hochgebirges als die höchste und die wasserscheidende der 3 Kammlinien. Zugleich zeigte sich, dass der Karakorúm es ist, der nach Westen in den Hindu-kush sich fortsetzt, während man bisher den Künlün für die entsprechende an den Hindu-kush sich anschliessende Kette gehalten hatte.¹

In the same summer of 1856, ADOLPH SCHLAGINTWEIT reached the Mus-tagh Pass, August 22nd, but robbers prevented him from going farther north. He gives the height of 19,019 feet. Zwischen dem Karakorúm Passe in Ladak und dem Mustágh in Balti ist keine Senkung in der wasserscheidenden Hauptkette bekannt geworden, die als Übergangsstelle benützt werden könnte, und für den allgemeinen Handelsverkehr ist selbst der Mustágh-Pass ein viel zu schwieriger, für Pferde ganz ungangbar, auch wenn unbeladen. He remarks that the Mustagh is used not only for the pass but for a considerable part of the western Kara-korum as well.

Adolph v. Schlagintweit regarded the Mustagh Pass at the first point west of the Kara-korum Pass, where the water-parting range could be crossed: Auf der südlichen und auf der nördlichen Seite befinden sich ausgedehnte Gletscher, ungleich grösser in ihrer Ausdehnung als die bedeutendsten Gletscher der Alpen. In the higher villages he was told that the road across the Mus-tagh Pass had been absolutely closed since 4 years, or 1852, on account of the plundering Hunza tribes, who made prisoners of the caravans and sold them as slaves to Badakshan. His journey to the pass he describes thus:

Mit vieler Mühe gelang es mir daher, an hundert der unternehmendsten Leute aus den oberen Dörfern zu bewegen, mich so weit als möglich zu begleiten. Nach acht langen Märschen, wovon vier den grossartigen Mustágh-Gletscher entlang führten, erreichte ich die Höhe des Mustágh-Passes. Ausgedehnte Firnmeere breiten sich rings um den Pass aus. Die Gipfel in der unmittelbaren Nähe des Passes sind im Allgemeinen 21,000 bis 22,000 Fuss hoch. . . . Ein hoher Gipfel in geringer Entfernung ist sicher über 24,000 Fuss hoch. Ungefähr 10 starke Märsche (meist 11) hätten mich nach Yarkand geführt.²

The peak which he believed to have a height of more than 24,000 feet was, according to Hermann, »the western Masheribrúm-Peak«, for which he, from Adolph's trigonometrical observations, got 25,626 feet. On Walker's map of 1868 the same peak had a height of 25,676 feet.³

On his way to the Mus-tagh Pass Adolph took the road from Húshe to the Sóspor Glacier, Chorkóna, Chorkóna Glacier, Háldi, Shígar, Chutrón, Braháldo, Askóli Shúshing, Mus-tagh Glacier, Mus-tagh Pass, and back *viâ* Shóra La, Shígar

¹ *Die Pässe über die Kammlinien des Karakorum und des Künlün in Balti, in Ladak und im östlichen Turkestan.* Von Hermann von Schlagintweit-Sakünlünski. *Ab. d. k. bayer. Akad. d. Wiss.* II. Cl., XII. Bd., I. Abth. München 1874, p. 13 and 60.

² *Bayer. Akad. d. Wiss.*, loc. cit., p. 16.

³ *Ibidem.* *Cp. The Scientific Results*, Vol. II, p. 427.

and Skardo. Regarding the road from the Mus-tagh Pass to Yarkand, Adolph got the following information: it begins from Shaklók on the right side of the northern Mus-tagh Glacier which used to be the resting place on the northern side of the Kara-korum Range. Tso Kha, a little lake at the right lateral morain; Paróng at the end of the glacier; Chángal (Jangal) with the snow-free pass Skam La; Shiágs, Gámbo Chu with the Agir Pass; Surukovét; Dóva and Dóva Pass, which was supposed to cross the Western Kwen-lun, Máliksha; Úrdalik; Cheróska; Pas Kuikdo; Khalastán in the valley of the Tisnab; Kokyar, Karghalik and Yarkand.

To the N. W. of the Mus-tagh Pass the brothers later on heard of two other passes across the Kara-korum. One of these, some 30 miles from the Mus-tagh, was called Shíngshal. The other, the Húnze Pass, was the western-most one, so far known, across the Kara-korum. It could be used by caravans from Gilgit to Yarkand, and was believed to be some 18,000 feet high. But as the precipitation increases from Ladak to Balti and farther N. W., the amount of snow becomes greater than in the east. Sometimes the passage was difficult even in summer. In the winter and spring the passes were said to be closed for several months.¹

The information regarding the roads to Yarkand, which was gathered by Adolph and Hermann, was in later years proved by other travellers to be correct.

His last, tragic, journey Adolph began from Panjab in 1857.² He touched the western end of the Panggong-tso and followed a completely new and unknown road to Turkestan. Crossing the Marsimik-la he came down to Pamsal in the Changchenmo valley. At Kiám he met the last shepherds south of the Kara-korum. Kiam was situated somewhat above the entrance of the Chang Lang valley, which must be our Goghra with the road to Chang-lung. Krystallinisches Quarzgestein, metamorphisch. Auf diesem lagernd folgen dann auf der rechten Seite des Changchenmo-Thales gegen Norden die sedimentären geschichteten Gesteine. To be able to enter the Chang-lung valley, his men had to dig steps in a slope for the ponies; these steps were seen by SHAW 11 years later. On June 18th he went up to the pass (18,839 feet)³ and camped at Kala Pahár opposite to Nichú. The water goes to a little lake situated at some distance to the east.

The pass was called Chang Lang or Chang Chenmo. Another pass was seen in the Kara-korum Range only $2\frac{1}{2}$ miles to the N. W., a third at $3\frac{1}{2}$ miles S. E. and a fourth at 8 miles S. E. The one he used seemed to be the easiest of all. JOHNSON'S Lungkám Pass is probably one of the four, and reported to be 19,533 feet high. Both Adolph and Hermann Schlagintweit have obviously understood that the Chang

¹ Loc. cit., p. 18.

² *Reisen in Indien und Hochasien*, loc. cit., p. 225.

³ This pass may easily be the one which was called Chang-lung-yogma by my Ladakis in 1906. I found the height of 18,958 feet.

Lang Pass belonged to the Kara-korum Range and had the same geographical rank as the Kara-korum Pass.

Then he crossed the Lingzi Thang in two days and recognized this plateau as situated north of the Kara-korum Range. The average height was found to be 17,500 feet. For the whole plain north of the Kara-korum Range, Adolph has the name of »Great Aksái Chin» (»The white desert of Chin»). »Little Aksái Chin» he says is below the Kisil-korum Pass. Hermann is aware that this plateau is an old lake basin, which he believes has been emptied by erosion. This view reminds us of DREW'S theory which, however, is not quoted by Hermann von Schlagintweit.

On June 22nd Adolph crossed the small ridges which divide Aksai-chin in two halves. Next day he travelled along the salt lake Patsalung. Continuing W. N. W. he crossed the range (17,500 feet) which separates the great Aksai-chin plains from the Kara-kash valley and reached this river a little below »Kiok Kiul» (Kok-köl). Then he proceeded down the Kara-kash River the same way his brothers had gone the previous year.

Having found Fort Shahidullah deserted, Adolph continued to the foot of the Kirgis Pass, which HAYWARD in 1868 fixed at 17,092 feet. Adolph preferred another branch of the Kwen-lun, which he crossed in Bel-davan. He took all sorts of observations, and made maps, panoramas and water colour paintings. July 6th he camped at the N. E. foot of the Taikotál Pass. At Camp Mazar he annotates gneiss and mica.

July 13th he got news of the troubles in Eastern Turkestan and sent out scouts to get reliable news of the situation. Two weeks later they returned and advised him to go by the Kilian road, which was still peaceful. From there he hoped to be able to escape to Russian Asia.

The Kilian Pass, situated in a range of secondary order which stretches far to the east, was found to be 17,200 feet high. He heard of the Sanju Pass farther east. In the same range Hermann mentions the Kárlik Pass, later on called Kullik on HAYWARD'S map. Adolph also got some information about the Yangi-davan in the main range of the Kwen-lun, although he got it under the name of Kokiar Pass. Still farther west in the same range, he heard of a Piriákh Pass.

August 5th he reached Chisganlik, crossed the northern valleys and ridges of the Kwen-lun Mountains, reached Kargalik the 9th and Kashgar on the 25th. The next day he was made a prisoner, brought before the brutal Vali Khan and killed at an age of only 28 years and after three years of exploring work in unknown regions of the Tibetan border-land.¹

¹ The details on his death are to be found in *Results*, Vol. I, p. 43 *et seq.*: *Last Journeys and death of our brother Adolph.*

ADOLPH V. SCHLAGINTWEIT did not cross the Kara-korum Range in the ordinary Kara-korum Pass, which had first been reached by THOMSON and then crossed by HERMANN and ROBERT V. SCHLAGINTWEIT. He took quite another road. In his itinerary, as it first was published, it is said:

June 14th, Changchénmo, avoiding Leh, for greater facility of crossing in disguise the Tibetan frontier. July 9th, crossed the Karakorum chain by the pass north of Aksáë Chín, which lies three marches south-east of the Kara-korum pass, by a new and entirely unfrequented road. July 20th, crossed the Kuenlúen, near Karangoták.¹

In a later list of his route it is said: Juni 10., Ueber den Masimik-Pass (Marsimik-Ia); Juni 11., Pámshalan (Pamsal) am Changchénmo Flusse; Juni 18., Ueber die Karakorum-Kette *viâ* Changchénmo- oder Chang Lang-Pass; August 4., Ueber die Künlün-Kette *viâ* Kilian-Pass.² It was proved that Adolph had crossed the northern Kara-korum Range not 30, but 70 miles S. E. of the Kara-korum Pass.³ It is a pity that the maps published of the important journeys of the Schlagintweits are all on a very small scale, and one is, therefore, often at a loss in one's attempts to follow their routes in detail.⁴

* * *

Only a few words should be added regarding the interesting map of the Schlagintweit's journeys, published in 1861.⁵ In Eastern Turkestan we find Kashgar-darya, Yarkand-darya, Karakash-darya, Khotan-darya, Yurumkash-darya and Keriya-darya, all on separate courses crossing the desert and forming the Tarim and bound to Lake Lop in the northern part of the desert.

From Hindu-kush a range branches off N. W., called Pamir. To the east the Hindu-kush continues without any interruption in the very strongly marked range of the Karakorum. North of it is Kuen-Lúen. Just south of the Chinese Namur lakes of Western Tibet, the Kara-korum Range continues to the east; at 86° it turns

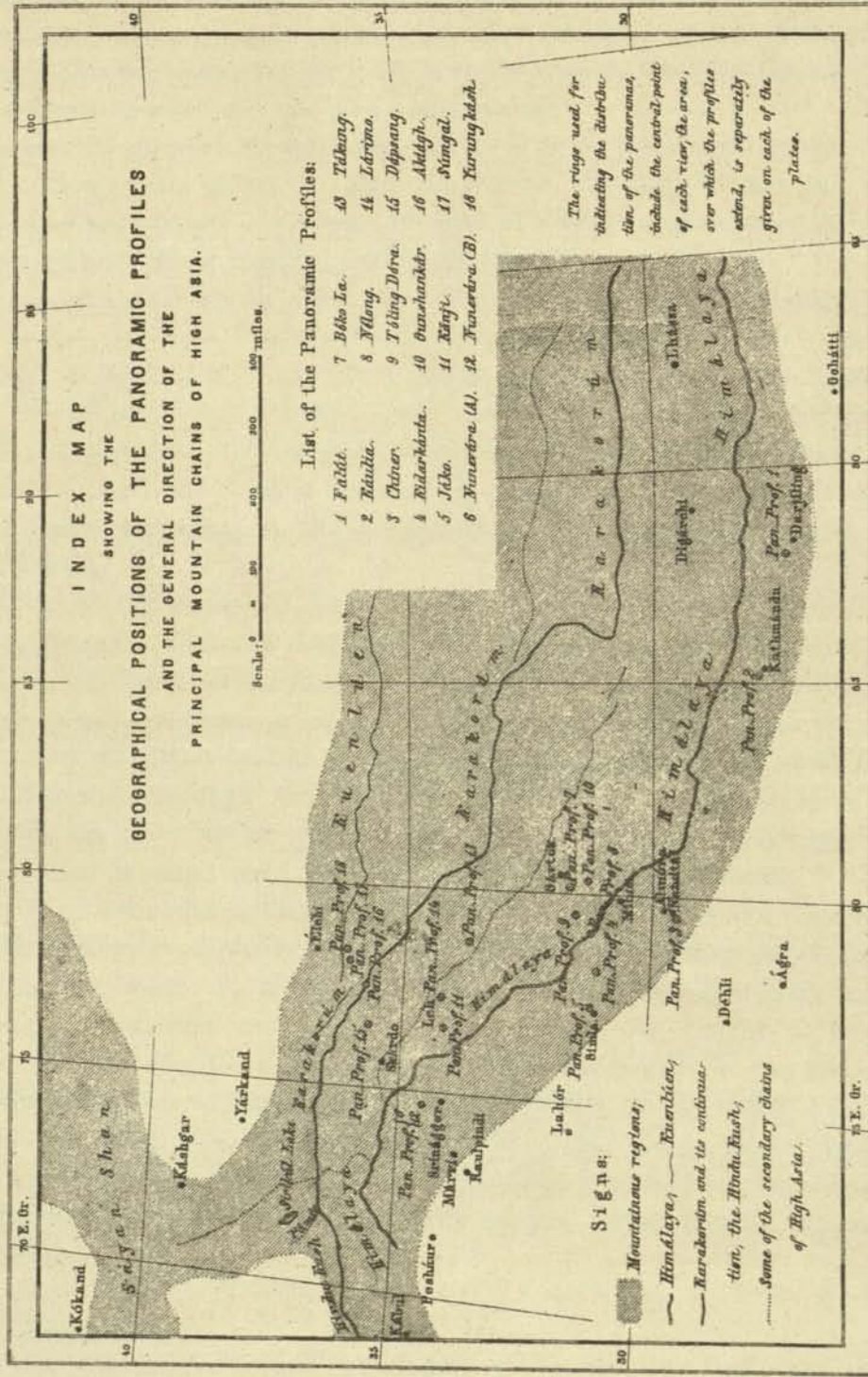
¹ *Results*, Vol. I, 1861, p. 33.

² *Abh. d. k. bay. Akad.*, loc. cit., p. 22.

³ Hermann writes: Nach den Angaben, die man bald nach der Kunde von Adolph's Ermordung sowohl in Indien als in Russland sammelte, schien es, etwas abweichend von dem was jetzt in seinen eigenen Aufschreibungen sich zeigt, als ob sein Uebergang über die Karakorum-Kette nur 30 engl. Meilen südöstlich von unserem gelegen habe, aber jener über die Künlünkette viel weiter von unserem Elchi-Passe entfernt sei, und zwar gegen Osten bei Karangoták liegend. Doch es liegt Adolph's Uebergangsstelle etwas über 70 engl. Meilen noch weiter südöstlich, als ich früher annahm; jener über den Künlün dagegen liegt westlich noch und nördlich von unserem Elchi-Passe; Entfernung 62 engl. Meilen. — Loc. cit., p. 19.

⁴ In Vol. III of *Reisen in Indien und Hochasien*, there is a map in 4050000: *Karte des Westlichen Hochasien nach den Reisen von Herm., Ad. & Rob. v. Schlagintweit, 1854—1858 und den neueren Daten der Mitglieder der Gr. Trig. Survey, etc. Zusammengestellt von Hermann von Schlagintweit-Sakünlünski*, Jena 1871. — On this map we find, between the Kün-lün and the Karakorum, a Plateau von Turkistán. In the S. W. corner of the same map there is a *Übersicht der Gebirgssysteme & Stromgebiete von Hochasien*, which is nearly the same as my reproduction Pl. LI.

⁵ *Routes taken by Hermann, Adolphe and Robert de Schlagintweit in India and High Asia, from 1854 to 1858.* — Vide Pl. XIX, Vol. III, *supra*.



The Kara-korum according to the Schlagintweit brothers, 1861.

south, and then again takes an easterly direction, at 31° North lat. going south of the Tengri-nor; at 95° East long. it finally comes to an end. When dealing with the Transhimalaya I have already pointed out the fact that on the Schlagintweit's map the range with the Kara-korum Pass, and the range between Tengri-nor and Lhasa, are, uninterruptedly, one and the same system.

On the map in question Adolph's last journey is not correct, and Hermann says in Vol. IV of his work, that, when this map was drawn in 1861, he had not yet obtained all his brothers' diaries. At any rate one sees what a great area of Western Tibet was covered by the journeys of these brothers.

In *Petermanns Mitteilungen* for 1861, Tafel 10, there is a little map which is only a copy of the first map of the brothers. Here the Hindu-kush is the direct continuation of the Kara-korum. The Kara-korum Pass is placed in the Kara-korum Range, and the Kwen-lun is an independent system north of it which comes to an end W. S. W. of Khotan. The High Kara-korum with the gigantic glaciers, seen and beautifully painted by Adolph, is missing altogether. West of Kashgar and Yarkand is a range stretching N. W.—S. E. and west of its southern part is another range called Pamir.

On Pl. VII in the series of Panoramic Profiles of the snowy Ranges of High Asia, *The Karakorum, with the Plateaux in Turkistán, and the Kuenlün, drawn and surveyed by Hermann and Robert de Schlagintweit*,¹ there is a little insignificant map² which I have reproduced as Pl. LI on account of its orographical interest. It shows plainly how Hermann looked at the Kara-korum System in its great features. It stretches diagonally through the whole of Tibet to the regions N. E. of Lhasa, whilst the Kwen-lun is a smaller system coming at an end S. W. of Khotan. Going straight south from Yarkand one, therefore, first meets the Kara-korum.

The first report about the Schlagintweits' journey northwards was communicated by Col. W. H. SYKES in an article: *Journey across the Kuen-lun from Ladak to Khotan*.³ The title would be all right, unless we read about the Saser Pass that the large groups of glaciers surrounding it were »one of the largest accumulations of glaciers in the Kuen-lun«, which proves that the Kuen-lun in the title also is meant to include the Kara-korum. »Khotan« in the title of the paper, includes the whole province of which Ilchi is the capital. When JOHNSON is always reported to be the first European who reached Khotan from India, it should be remembered that the Schlagintweits had done it some 9 years earlier, although they did not visit the town itself.

¹ *Results*, Atlas, 1861.

² *Index map showing the Geographical positions of the panoramic profiles and the general direction of the principal mountain chains of High Asia.*

³ *Proceedings Royal Geographical Society*, Vol. I, 1855—56, p. 275 et seq.

In a reprint in Calcutta of the same article, the title is more correct: *An account of a Journey across the Chains of the Kuenlun, from Ladak to Khotan.*¹ But even in this article, which is written by Hermann and Robert themselves, it is surprising to read: »Extensive glaciers are chiefly met with in the range to the north of Karakorum, and another group, apparently the largest accumulation of glaciers in the Kuenlun, was found in the environs of Sassar, but both much smaller than the groups near the Diemer, to the north-west, investigated by our brother Adolphe.« Here the range which is crossed in the Kara-korum Pass is obviously regarded as one of the chains of the Kwen-lun System.

AHMED SHAH did not leave the least doubt regarding the road he took, namely over the Kumdan glaciers. The Schlagintweits' report is not quite clear on this very point. But as they have nothing to say of the Kumdan glaciers and only describe the way up to the Dapsang plateau, and say that they returned the same way, it seems obvious that they took the Murghu road. They say in the last-mentioned report: »we were obliged (as the river was still too swollen) to leave the road down the Shayok Valley at Sultán Chückül, to go up the Valley to Sassar, and follow from thence our old route. We had to cross in one day, not without difficulty, the Shayok River five times before we reached Sassar.« At first sight this looks as if they came by the Kumdan road, for, coming from Murgu and going to Saser, one needs to cross the river only once. But probably they went down some distance, and finding the river too strong, returned northwards back to Saser.

More interesting is the following passage:² »The point where the plateaux reach the greatest mean elevation, probably the loftiest plateau in the world, is a little to the north of the sources of the Shayok. To the south of this region between Karakorum and the Nubra Valley, a second region of a great general elevation was found, in which some single peaks seem to attain the greatest absolute height.« These words to a certain extent indicate that they suspected the existence of two more or less parallel Kara-korum Ranges.

Speaking of a little sketch map sent by HERMANN and ROBERT SCHLAGINTWEIT in May 1859 to the Geographical Society in Paris, Dr. A. PETERMANN says:³

Diese Karte belehrt uns vor Allem, dass der Kuenlün eine von der des Kara-korum durchaus verschiedene Bergkette ist, indem der erstere etwa unter 36° N. Br. von West nach Ost, die letztere vom Kara-korum-Pass an nach Südosten, parallel dem Himalaya, verläuft. Diese Anordnung hatte Alexander von Humboldt aus einigen Andeutungen Chinesischer Reisenden errathen und auf seiner bekannten Karte der Gebirgsketten und Vulkane in Centralasien (1843) dargestellt; spätere Forscher, wie Dr. Thomson, identificierten aber den Kuenlün wieder mit dem Kara-korum und keiner war im Stande, aus eigener

¹ *Journal Asiatic Society of Bengal*. Vol. XXVI, 1857, p. 110 et seq.

² *Ibidem*, p. 116.

³ *Petermanns Mittheilungen*, 1859, p. 351.

Anschauung Aufschluss zu geben, denn vor Schlagintweit's hat kein gebildeter Europäer die beiden Ketten überschritten Sie erkannten, dass die Kette des Künlün nicht die Wasserscheide bildet, wie das auf Alexander von Humboldt's Karte angedeutet ist, sondern dass sie an ihrem westlichen Ende von dem Yarkand-Flusse begrenzt und weiter östlich von den beiden Strömen durchbrochen wird, welche bei Karakash und Keria vorbeifliessen Diese beiden Flüsse entspringen auf den 15000 bis 16000 Fuss hohen Hochebenen zwischen dem Künlün und Karakorum.

This view of PETERMANN is hardly accepted by HERMANN VON SCHLAGINTWEIT, who says that HUMBOLDT in the material at his disposition, could not find any indication of the heights and passes between the Kwen-lun and the Kara-korum.¹

HUMBOLDT himself certainly had a very strong feeling that the country between the Himalaya and Kwen-lun was a *terra incognita* and that the Chinese information was far from sufficient. Therefore, he took the initiative in the journeys of the Schlagintweits. On account of Humboldt's recommendation they were allowed to travel all over the Himalayas for 3 or 4 years. It was thus to a great extent Humboldt's merit that the two systems Kara-korum and Kwen-lun were distinguished from each other already in 1856—57.² Regarding the Kwen-lun, they may be said to have proved that Humboldt's maps and theories were correct in this point.

Hermann von Schlagintweit, in 1880, pays attention to the fact, that on the map to Humboldt's *Asie Centrale*, 1843, there is no Kara-korum:

Die Karakorum-Kette fehlt dort noch vollständig, auch in ihrem westlichen und nordwestlichen Theile; da damals nur Material nach Angaben von Eingeborenen vorlag, blieb die Existenz der wasserscheidenden Kette ganz unbekannt; auch wurde deshalb dem Künlün, statt dem Karakorum als der centralen Kette, der Hindukush in der Fortsetzung der Erhebungslinie angeschlossen.³

Even after the journeys of the Schlagintweits in 1856, Humboldt believed, in his *Kosmos* as mentioned above, that the Kara-korum Range was only a part of the Kwen-lun and quoted the authority of THOMSON in making the Kwen-lun and the Hindu-kush into *one* range. We find, for instance, the following fundamental laws:⁴

¹ *Reisen in Indien etc.*, Vol. IV, p. 299. On the Map of the Punjab and adjoining Countries, compiled by Col. A. S. Waugh in 1854, the Kara-korum Range comes to an end a little east of the Kara-korum Pass, and leaves us in the dark as to whether the range continues in the Kwen-lun or in any other range.

² *Petermanns Mittheilungen*, 1855, p. 142. Cp. also *Pet. Mit.*, 1859, p. 352; and *Die Ergebnisse der wissenschaftlichen Mission der Gebrüder Hermann, Adolph und Robert v. Schlagintweit nach Indien und Hoch Asien, in den Jahren 1854 bis 1858*. With maps. *Pet. Mit.* 1861, p. 268. — In his *Physikalisch-geographische Schilderung von Hoch-Asien*, *Pet. Mit.* 1865, p. 361, Robert von Schlagintweit has given an excellent *résumé* of the subject as far as it was known in 1865. — I need not to say that innumerable books, papers, and articles deal with the journeys of the brothers. A bibliography is added to the work: »*Reisen in Indien . . etc.*»

³ On the map in the German edition of Humboldt's *Central-Asien (Gebirgs-Ketten und Vulkane in Central-Asien nach den neuesten astronomischen Beobachtungen und Höhenmessungen von A. v. Humboldt, 1844)* the Nubra or Kara-korum is represented, as may be seen on our reproduction Pl. XXXII which is the same as the one mentioned by Schlagintweit.

⁴ A. von Humboldt: *Kosmos. Entwurf einer physischen Weltbeschreibung*, 1858. Band IV, p. 379.

»dass der Hindu-Kho von Chitral and Kafirstan eine westliche Fortsetzung des mächtigen, Tibet gegen Norden begrenzenden, das Meridian-Gebirge Bolor im Tsungling durchsetzenden Küen-lün ist.» — Further:¹ »Der Hindu-Kho oder indische Kaukasus, eine Fortsetzung des nordtübetischen Küen-lün, westlich von der durchsetzenden Meridiankette des Bolor....» — And:² »Die Bolor-Kette durchschneidet den Hindu-Kho.» Humboldt identified the classic Imaus with his Bolor.³ Sir R. J. MURCHISON is right when he says in his address of 1858, that the feat of the Schlagintweits was to find north of the Kara-korum,

another parallel east and west range.... According to these travellers, this is the Kuen Luen of Klaproth and Humboldt.... The Schlagintweits are the only geographers who have visited those localities. They sustain, in fact, the view of Humboldt, and affirm that his Kuen-Luen presents all the characters, relations, and altitude of an independent chain, as laid down by that great geographer in his 'Asie Centrale'.⁴

Therefore, and to recapitulate the chief results gained in our regions by the SCHLAGINTWEITS, they proved that the Kwen-lun was a mountain system to the north of the Kara-korum. The Kara-korum is the great water-parting of this part of the continent. Rivers originating from it pierce the Kwen-lun to the north and the Himalaya to the south. The Kara-korum is supposed to continue to 95° East. The Kara-korum Pass is situated in the Kara-korum Range and not in the Kwen-lun. The Kara-korum peaks are lower than those of the Himalaya, but its ridges and passes higher. The name Kara-korum, which usually belonged only to the pass, should be attributed to the whole range. The Kara-korum is called the main range of High Asia. The plateaux are more extended on the northern than on the southern side. The name Mus-tagh was found to be used only for the western portion of the Kara-korum Range, and especially for the pass. The pioneer record of Dr. Thomson was beaten beyond the pass to which he had reached, across the Kwen-lun to Yarkand and Kashgar in Eastern Turkestan.

¹ Op. cit., Band II, p. 188.

² *Ibidem*, p. 241.

³ Op. cit., Band IV, p. 608.

⁴ *Journal Royal Geographical Society*, Vol. 28, 1858, p. CLXXXIII *et seq.*

CHAPTER XXVII.

GODWIN-AUSTEN.

In 1858 Sir R. MURCHISON reminded the members of the Royal Geographical Society that the gigantic peaks which enclose the lofty plateau of Tibet, and separate India from Turkestan, had generally been considered by British geographers as constituting one vast mass, or sea of mountains.¹ He regards the mountains as being concentrated in the west, in a knot or group around the Hindu-kush, from where they expand to the east and south in the shape of a fan. Farther north and beyond the plateau of Tibet is a band of parallel altitudes, also starting from the same western knot and proceeding southeastwards. — This is the Mus-tagh which farther east »acquires the synonym of Karakorum. This last range, which, still further to the east, is the Kailas.... has for some years been marked on maps as the watershed of the mountain region which separates the drainage of India from that of Turkistan and China.» This opinion of the watershed was the dominating one in these days.

It is curious that Murchison could say of this axis or water-parting: »the same chain was passed over in its far eastern prolongation by HUC and GABET, though, unfortunately, they have given us no materials by which we can define its orographical features». How could he know that Huc crossed the same chain which THOMSON had reached in the Kara-korum Pass? It was a theory which happened to be correct, and it proved that MURCHISON was a very clear-sighted man.

In this address MURCHISON gives a rather good *résumé* of what was known of these regions in 1858. He ascertained that already in 1838, Dr. FALCONER crossed the mountains of Iskardo, and followed up one of the sources of the Indus by the valley of the river Braldo to about 36° N. lat., on the glacier which hangs upon the southern face of the Muz-tagh or Kara-korum. Murchison, in the same address, calls the Himalayan regions: »that part of Asia to which, as Englishmen, we attach deep interest, as constituting the northern frontier of our Indian possessions,

Journal Royal Geographical Society, Vol. 28, 1858, p. CLXXXIII *et seq.*

which geographers revere as the loftiest region of the earth, and which it has been the ambition of Humboldt through life to visit in person.» It is curious that it should take another 50 years before the great *terra incognita* beyond this northern frontier underwent a preliminary European survey!

In many communications and notices of the early volumes of his *Mitteilungen*, Dr. AUGUST PETERMANN mentions with great admiration the progress of the magnificent work carried out by the Survey of India.¹ In the volume of 1861,² is a little map by Petermann showing the Kara-korum Mountains as a very sharply demarcated range. The text to this map has the title: *Die englische Vermessung von Kashmir*, in which Petermann pays special attention to the important additions by VIGNE, STRACHEY, MONTGOMERIE, &c. He reminds us of Major H. L. THUILLIER'S communication that, during the progress of the Survey, many peaks had been measured in the Kara-korum and Mus-tagh Range, and that then the height of the K 2 had been fixed at 28,278 feet. — In früheren geographischen Nachrichten und Reisebeschreibungen wird zwar öfters die bedeutende Höhe des zwischen Mustag- und Karakorum Pass gelegenen, bald Mustag benannten, bald zum Kuen Luen oder zum Karakorum-Gebirge gerechneten Bergzuges erwähnt; but in vain Petermann looks out for a more definite determination of the highest peak of the Kara-korum. STRACHEY and THOMSON did not know it better than VIGNE, and ADOLPH SCHLAGINTWEIT did not see it.

In an article: *Die Riesengletscher von West-Tibet*,³ we find an extract from MONTGOMERIE'S report in the *J. As. Soc. Bengal* 1862, a matter which is outside of our subject. PETERMANN adds: Wir dürfen hier nicht unerwähnt lassen, dass das grosse Schlagintweit'sche Werk über Indien und Hoch-Asien jene erhabene Gebirgs- und Gletscherwelt West-Tibets in mehreren Profilen und Gemälden vorgeführt hat.

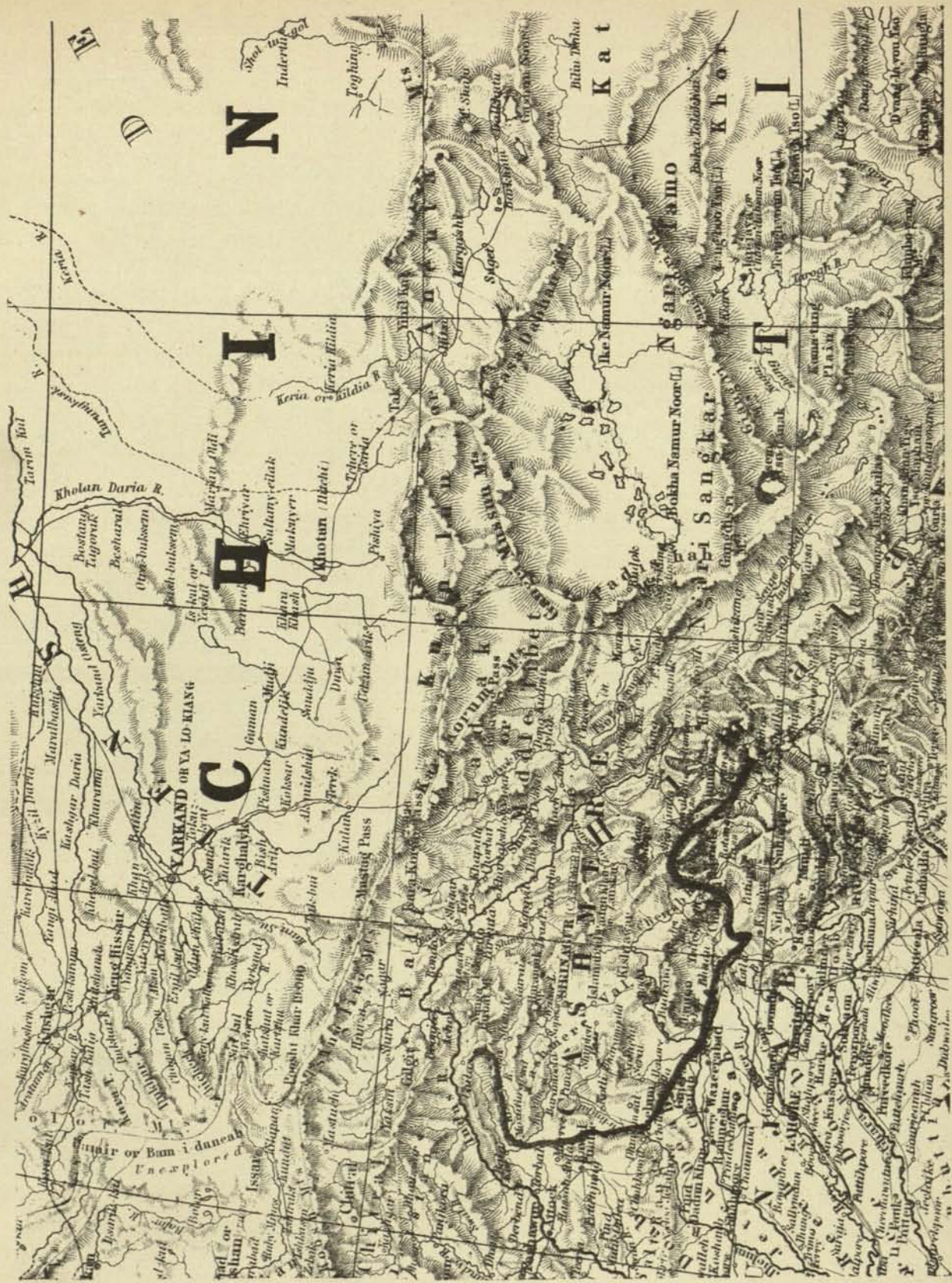
In the year 1864 two very important and celebrated works appeared regarding the geography of Asia, namely: *Cathay and the way thither*, by Sir HENRY YULE; and *Die Post- und Reiserouten des Orients*, by A. SPRENGER. But already from the titles of these works we may suspect that they cannot possibly throw any light over the region interesting us.

A curious representation of our mountains was, at about the same time given on *Stanford's Library map of Asia* constructed by A. Keith Johnston, London 1862, Pl. LII. South of Yarkand it shows the Tsing-ling M^{ts} which, S. W. of Khotan, divides into two branches, the northern one called Kuen-lun or Aneuta M^{ts}, the southern one, Kara-korum M^{ts} Padishah. The two systems are joined by two ranges running

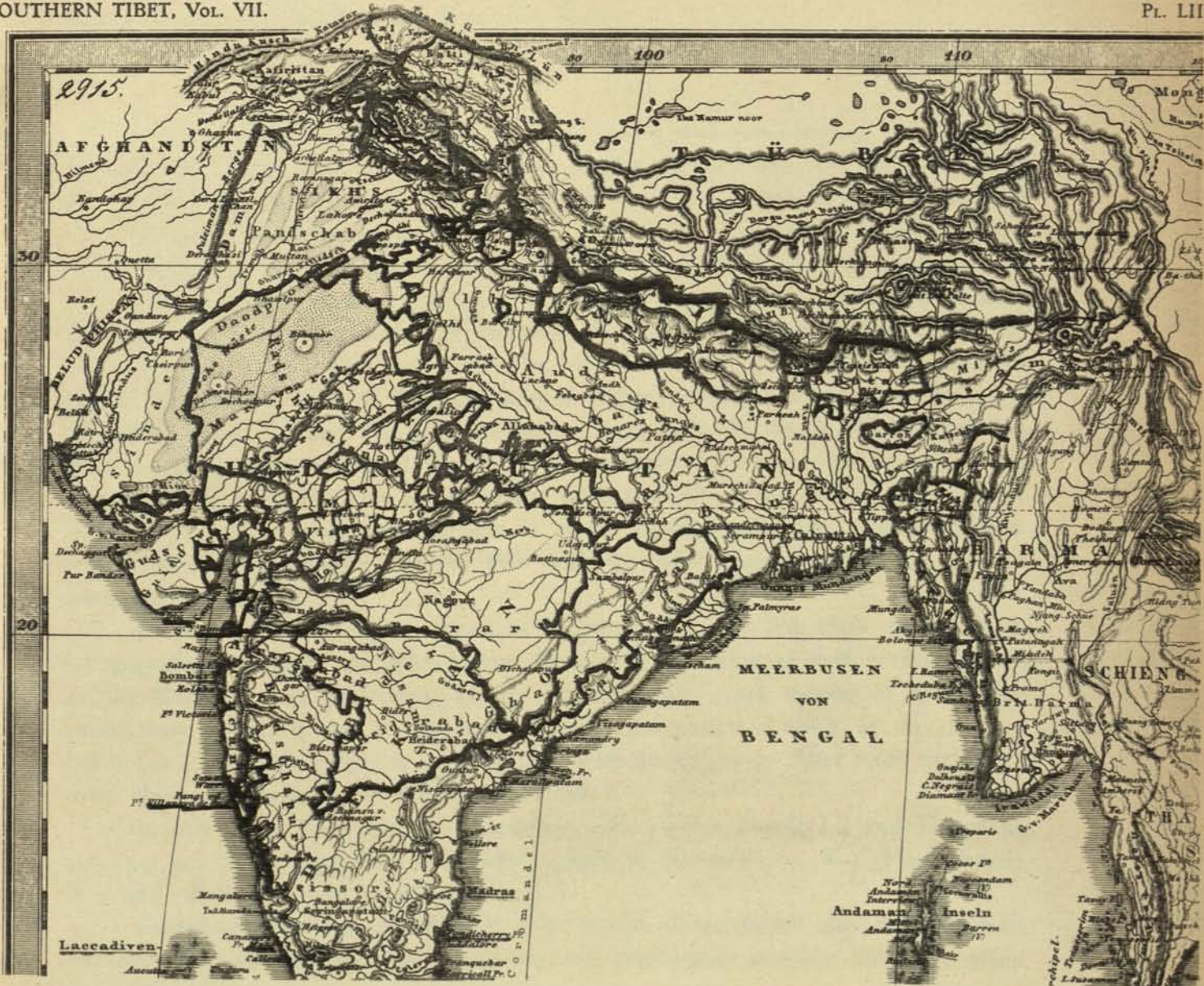
¹ E. g. in *Pet. Mit.* 1860, p. 196.

² P. 1.

³ *Pet. Mit.* 1863, p. 66.



Stanford's Library map of Asia constructed by A. Keith Johnston, London 1862.



Ost-Indien mit den Inseln. Gotha 1863.

GEN. STAB. LIT. ANST. ST. HELM.

S. W.—N. E. and called Gangri Mussun M^{ts}. and Giangri—Lang-boo-ri M^{ts}. The mysterious Tsasa Dabhan M^{ts}. are also entered.

Pl. LIII shows a new edition of the map of STÜLPNAGEL: *Ost-Indien mit den Inseln* (coloured, 38×29 cm., 1:18,500,000), Gotha 1863. The Kara-korum Pass is still shown as situated in the Kwen-lun Range.

* * *

With GODWIN-AUSTEN one of the really great and epoch-making names makes its entrance in the history of exploration of the Kara-korum. In his article *On the Glaciers of the Mustakh Range* and on the map accompanying it, Captain H. H. GODWIN-AUSTEN gives us a much fuller and more complete idea of the glacier world of Western Kara-korum, than we ever got from his predecessors.¹

He begins his work, August 5th, 1860, from the village of Kiris, and ascends the Bianchu, 16,000 feet high. A crossing of a pass and a glacier takes him into the valley of Thüllè. The next valley he visits is Hushè. From a high peak he had a magnificent view of the Kara-korum Range, »rising 22,000 feet, with fine needlelike forms.... and yet these mountains were only the spurs which ran down from the great masses beyond them». From another station at the left side of the same valley he had a fine view up the Hushè valley to Masherbrum, »rising to 25,000 ft. with its pink-tinted rocks shining out in warm contrast with the masses of snow which rested on its sides.» »From this peak the Atoser and Masherbrum glaciers were coming down.»

From a peak situated southeast of Skardo and 17,500 feet high, he has again »a magnificent view of the Kara-korum Mountains, or rather of that portion known as the Mustakh; but presenting at this distance only great masses of everlasting snow, from off which rise several fine peaks to the west and deep in the distance below lies the Skardo valley, and its junction with the Shigar.» After some excursions from Shigar he finished the work of the year.

In July 1861 he continued his survey work. From Boorje La and Thyarlung (16,844) are to be seen Peak K 2, »the highest on this side...., K 1 (Masherbrum), K 3 and others, all over 24,000 in height.»

Godwin-Austen was not only a very careful surveyor, he also travelled with his eyes open for the geological questions and phenomena in these difficult regions.

The height of the upper lacustrine deposit at Kuardo is quite 4000 feet above the present river, and this deposit also rests on the rock of Skardo in the town. This attracts the attention at once, for it indicates plainly that the whole breadth of the valley has at some time been filled up to that level.

¹ *Journal Royal Geographical Society*. Vol. 34. 1864, p. 19 *et seq.*
30. VII.

He found traces of an old lake, and a recent one in the valleys around Skardo. At the village of Kipchun he saw the terminal moraine of a great glacier from the gorge above, jutting out a full quarter of a mile into the plain.

The glacier coming from peak Mungo Gūsor was 6 miles long. Opposite the village of Askole the Braldoh was crossed on a rope-bridge: »This fine tributary to the Indus is here a roaring boiling torrent, of an ochre colour, showing that its glacier sources are not far distant.» Of his visit to Askole, Godwin-Austen says: »Save M. A. Schlagintweit, I was the only European that had ever been seen there.»

Then he reached the foot of the magnificent glacier of Biafo, which terminates at an elevation of 10,145 feet. Of the Punmah glacier he observes that it was »on the advance together with all its detritus», which indicates an accelerated glacial activity for 1861, unless it was only a local one. Godwin-Austen at once understood the importance, from physico-geographical point of view, of all these great glaciers, and when they are, in our days, in a more or less sensational way, compared with the polar ice-masses, it should be remembered that Godwin-Austen, already in 1861, wrote of them:¹

We were now fairly within an icebound region, which for bleakness and grandeur is perhaps not to be surpassed: its glaciers exceed those of any of the mountain-ranges of the world, and are equalled only by those of arctic or antarctic regions, for though the Himalayas of Nepal are quite as high as those of the Mustakh, yet being so much further south, and of less breadth, the glaciers have not a like extent.

He climbed the Punmah glacier, crossed it, went to Skeenmung where it is formed by two branches, and went northwards on the Nobundi-Sobundi glacier, which is formed by many other ice-streams. Two peaks were here found to be 23—24,000 feet. From a high station, there could be seen the great plateau of ice from which the last-mentioned glacier takes its rise. Of these regions he says: »It is a vast sheet of ice, with only a few sharp points of rock sticking out here and there. Snowy ridges stretched away towards Yarkund.»

On August 11th Godwin-Austen started early »for the direction of the Mustakh or Pass over the Karakoram Mountains into Yarkund». He did not reach the pass itself, but had to return from a height of 17,301 feet, or about 500 feet below the pass. »The only other European who had tried the Mustakh Pass was M. Schlagintweit, who was equally unsuccessful.»²

After this excursion he went to the Biaho glacier, upon the difficult surface of which he made some marches. The Mustakh ridge was on the north, the Masherbrum on the south. The lateral glaciers were separated by sharp precipitous ridges of

¹ Loc. cit., p. 30.

² Not quite equally, for he reached the pass, the height of which he gives as 19,019 feet, whilst FILIPPI, 1909, gives 19,000 feet. GODWIN-AUSTEN who travelled five years later, turned back from a point 1,700 feet lower down.

granite. Two cone-shaped peaks (K 3 and K 3a), or Gusherbrum, were visible ahead. Higher up on the glacier he saw »the great Peak K 2 on the watershed of Asia! — the worthy culminating point of a range whence those waters have their sources which drain such vast regions. The elevation of Peak K 2, as determined by Capt. T. G. Montgomerie, R. E., is 28,265 feet.»¹

The Biaho glacier he estimates to be 35 miles long. The Biafo, on which he made a short trip, he estimates at 40 miles in length. Then he went down the Braldoh valley, passing Hoh Loombah with a large glacier, and had a dangerous crossing of the river Braldoh in skin-rafts.

Regarding the Braldoh trackways, GODWIN-AUSTEN gives us some interesting information.

The principal exit from the Braldoh valley is that to Yarkund over the Mustakh. According to the reports given me, the glacier on the northern side is as long as that on the southern, but in my opinion the journey would be longer, as I do not think that the way lies down its main stream, but that the main body of the ice would be towards the great Peak K 2, with another from the Peaks of Nobundi Sobundi. About four marches from the Mustakh Pass a track branches off to the westward, up a lateral stream, and over a ridge to the Hunzè river, by which the Braldoh people have often gone, as being safer than by Nagayr

Many years ago the main traffic lay up the Baltoro glacier, twelve miles east of the present Mustakh pass. The former pass became impracticable owing to the great increase of snow.

On August 28th he started for the Basha branch of the Shigar River, visited Arundu and went up on the glacier of Chogo or Basha. Of the grand view he enjoyed from here he says:² »To the northwest there was the great glacier of the Basha, with the little village of Arundu at its termination, its fields touching the ice. On the west there was Peak B 14, or Haramosh, with its fine summit of eternal snow towering above all the minor cones and from which the lateral feeders in that direction were evidently derived. But the Nushik La and its glaciers were not visible, being shut out by the great intervening mass of ridges, and spurs, and glaciers.»

On September 3rd he made a new start, and went up the valley of the Kèro Loombah. Glaciers from side-valleys now and again close a main valley, by which

¹ In an article: *On the Trigonometrical Survey and Physical Configuration of the Valley of Kashmir*, WILLIAM H. PURDON says: »A recent letter from Northern India informs me that Captain Montgomerie has discovered in the Kárákorum, or Trans-Tibetan Chain, a peak measuring 28,400 feet above the sea; and Colonel Waugh, in his letter to Government, alludes to a peak measuring 28,270 feet above the sea; so that it is probable that here a rival will be found even to Mount Everest itself. We know as yet little of this region. Dr. Thomson ascended the Kárákorum Pass in 1846. He found it to be 18,660 feet above the sea; a great height for a pass even in the Himalaya.» — *Journ. Roy. Geogr. Society*. Vol. XXXI. 1861, p. 20.

² *Ibidem*, p. 47.

a dangerous temporary lake may be formed. Thus the Niaro glacier gave birth to a lake 200 feet deep, which fortunately discharged gradually during a month.

On the other side of the upper Biafo the snowy peaks Trans-Indus 2 and Trans-Indus 4 were visible. On the Kiro Ganse a road goes up to Nushik La, which is the northern watershed of the Basha-Braldoh. The whole district he describes as one great area of ice-bound mountains, with long trains of ice debouching out into the drainage lines. And he observes:¹

The present thickness of the ice is a point not easily determined; but judging from striae in the sides of ravines from which glaciers have retired, from 300 to 400 feet is not an exaggerated allowance for what they once have been.

Godwin-Austen was struck by great changes of temperature »in our own times«. He saw many proofs of this. Such were the enormous terminal moraines which in many places abut on the larger rivers, down to which point glaciers must once have descended, »and which in some cases must have rivalled in length the present ones of the Mustakh Range«. Such proofs were also the long furrows and striations in solid rock. Amongst proofs of recent changes he mentions:

Many Passes which were used even in the time of Rajah Ahmed, Shah of Skardo, are now closed. The road to Yarkund over the Baltoro glacier which before his time was known as the Mustakh, has by the increase of the ice near the pass become quite impracticable. The men of the Braldoh valley were accordingly ordered to search for another route, which they found in the present pass, at the head of the Punmah glacier above Chiring. Again, the Juserpo La can now be crossed only on foot; whereas in former times ponies could be taken over it. The pass at the head of the Hoh Loombah is now never used, though there is a tradition that it was once a pass; no one, however, of the present generation that I could hear of had ever crossed it.

He also quotes several cases in which certain large glaciers have obviously advanced in later years. These oscillations in the glaciation are very interesting; to the same class of phenomena belong also the oscillations in the Kumdan glaciers with which we have dealt in Chapter XXVII, Vol. II of this work.

After the paper² of GODWIN-AUSTEN, Dr. FALCONER, who was a veteran in the field, gave some interesting commentaries.³ He said that all the best observers, THOMSON, JACQUEMONT, and others, had been of the opinion that there was but one great system of mountains. There was no such thing as any break of a mountain-range, or any distinct mountain chains. There were rivers cutting across them, but, regarded in one grand aspect, they constituted a series or mass of mountains.

Viewed then, in this light, there were two great ranges which culminated to especially great altitudes, and which bounded the Indus river to the south and the north; and this being one of the points where the Himalayan chain attained its greatest elevation, there the glacial phenomena were developed in most grandeur and upon the loftiest scale.

¹ *Ibidem*, p. 50.

² It was read before the Royal Geographical Society, Jan. 11th. 1864.

³ *Proceedings Royal Geographical Society*. Vol. VIII. 1863—64, p. 38 *et seq.*

The paper referred to that part of the range which bounded the valley of the Indus upon the north, the Kara-Korum or Mooz-tagh or the »Icy Range of mountains«, and the other great series of them were the mountains which bounded the Indus upon the south.

Dr. Falconer related some glacial observations of other travellers and his own visit in 1838 to the Shigar valley and the valley of Bialdoh. Already 27 years ago he had been up to Arundu and thence he proceeded to the glacier of the Bialdoh River, »where he saw all the phenomena which had been described by Captain Godwin-Austen«. The Shigar valley was bounded by mountains of great elevation. Some of them had been measured by Major MONTGOMERIE and one had been found to reach 28,000 feet. »This naturally entailed a prodigious amount of condensation of the moisture of the atmosphere, and led to a very heavy fall of snow, the result of which was seen in these glacial phenomena.»

Having proceeded so far in our history of exploration, we have found how slowly the knowledge of these mountainous labyrinths developed, and how they prove, after every new conquest, to be more and more complicated. The classic Imaus and Emodus, the Chinese Ts'ung-ling, the European Montes tibetici indicated only one simple mountain wall to the north of India. HUMBOLDT makes it double, the Himalaya and the Kwen-lun. FALCONER still maintains that in the opinion of the best observers there is only one great system of mountains, but he agrees that from certain points of view one can talk of two great ranges south and north of the Indus. The SCHLAGINTWEITS proved that there are three great systems, the Himalaya, Kara-korum and Kwen-lun, and even suspected that the Kara-korum is double. Thus the farther we proceed, the more authoptic observations that are added to our store of knowledge, — the clearer it becomes how little we really know and how the distance, which still separates us from a complete understanding, and map image of the orography, becomes more and more considerable. So late as in 1911 Dr. ARTHUR NEVE added a third Kara-korum Range to the former two. And even now we are very far from the goal. Before it can be reached the geology of all these different folds must be thoroughly known, and there is a work which will take generations of scientifically trained explorers.

It cannot be otherwise. The classics only know that India was bounded to the north by mountains. The Chinese, who are good topographers but poor orographers, joined the whole lot of mountains into one Ts'ung-ling System. GASTALDI separated India from MARCO POLO'S deserts of Lop and Camul by one narrow strip of mountains. Even HUMBOLDT had insufficient material at his disposal. Only when the mountains were crossed by such men as VIGNE, THOMSON, the SCHLAGINTWEITS, MONTGOMERIE, GODWIN-AUSTEN, and others, it became clear that the upheaval between India and Turkestan consisted of an extremely complicated variety of chains, ranges, ridges and valleys.

We have seen that the case was exactly the same with Transhimalaya, although the first indication of its existence appears incomparably later on European maps, namely on D'ANVILLE'S. And it is not yet forty years ago since SAUNDERS represented as one single range, that which now has proved to consist of a whole system of different ranges, every one of them offering a hard task of exploring work for future travellers.

Before we leave Godwin-Austen's first important contribution to the knowledge of the Kara-korum, we should remember that he has illustrated his paper with a brilliant *Sketch Map of the Glaciers of the Mustakh Range (Trans-Indus), and Valley of Skardo &c.*,¹ which forms a gigantic step forwards, a fundamental document which never would lose its importance, but only be improved in detail and completeness. Between the head of his Nobundi Sobundi glacier and K2 he has the »Karakoram Range», as if this name only belonged to this part of the Mustakh Range. North of the Kara-korum Range the map shows a *terra incognita*, and there still, after 60 years, are regions in this world of inaccessible and majestic mountains covered with snow and ice, that never have been seen by Europeans.

¹ Vide *Journal Roy. Geogr. Society.* Vol. XXXIV, 1864, p. 19.

CHAPTER XXVIII.

JOHNSON'S JOURNEY TO KHOTAN.

When Sir RODERICK MURCHISON opened the season 1864—65 in the Royal Geographical Society he could say in his address:¹

Since the institution of this Society our acquaintance with the countries adjacent to Hindustan . . . the Himalayas, Nepaul, Tibet, Kashmir, Kabul amounts to a geographical revolution. The names of a few of the more prominent labourers in this wide field may be mentioned . . . Sir George Everest, Sir Andrew Waugh, the brothers Captain and Dr. Gerard, Colonel Richard and Major Henry Strachey; Colonel Strange, Colonel Thuilliers and Captain Montgomerie. The physical geography, botany, and natural history, including the phenomena of glaciers in this region, have been specially illustrated by the labours of such men as Dr. Joseph Hooker and Dr. Thomson, and, above all, of the late Dr. Hugh Falconer, and Captain Godwin-Austen.

At the opening of the next season he could even formulate a part of his address thus:²

During the years which the Survey has been directed in these regions by Capt. Montgomerie, he has informed us that the whole of the Karakorum and Mustakh range has been defined, forming the boundary between Little Tibet and Turkestan; and that the altitude of the peaks for 450 miles varies from 21,000 to 28,300 feet, a very much higher range than that of the Himalayas to the south of Ladak and Little Tibet.

Here Mustakh is the name of the western, Kara-korum the name of the eastern half of one and the same range, which was believed to be defined in the whole of its run. This opinion, that the Kara-korum was a rather short range, held its ground for some 45 years to come, for as I have mentioned before, even so late as in 1910, British geographers used the term Eastern Kara-korum for parts of the system which are situated on British territory, thus leaving out of consideration the tremendous eastern continuation of the system which is situated within Tibet. Sir Roderick points to the fact that the western parts of the Kara-korum System are much higher than the western parts of the Himalaya. As yet he could not add that, on the other hand, the eastern parts of the Himalaya are much higher than the eastern

¹ *Proceedings Royal Geographical Society.* Vol. IX. 1864—65.

² *Proceedings Royal Geographical Society.* Vol. X. 1865—66, p. 239.

parts of the Kara-korum System, for even when the journey of NAIN SING proved that the high peaks of Nien-chen-tang-la did not only exist in the Chinese sources translated by KLAPROTH and used by RITTER, it could not be known that Nien-chen-tang-la should be regarded as belonging to the southern Kara-korum System. Nor could it be known, although, perhaps, faintly suspected by some German geographers, that Father HUC'S Tang-la could be the continuation of the northern, water-parting Kara-korum. It is, however, worthy of notice, that a kind of compensation exists between the Himalayan and Kara-korum folds, so that the former reach their culmination points in the east, the latter in the west.

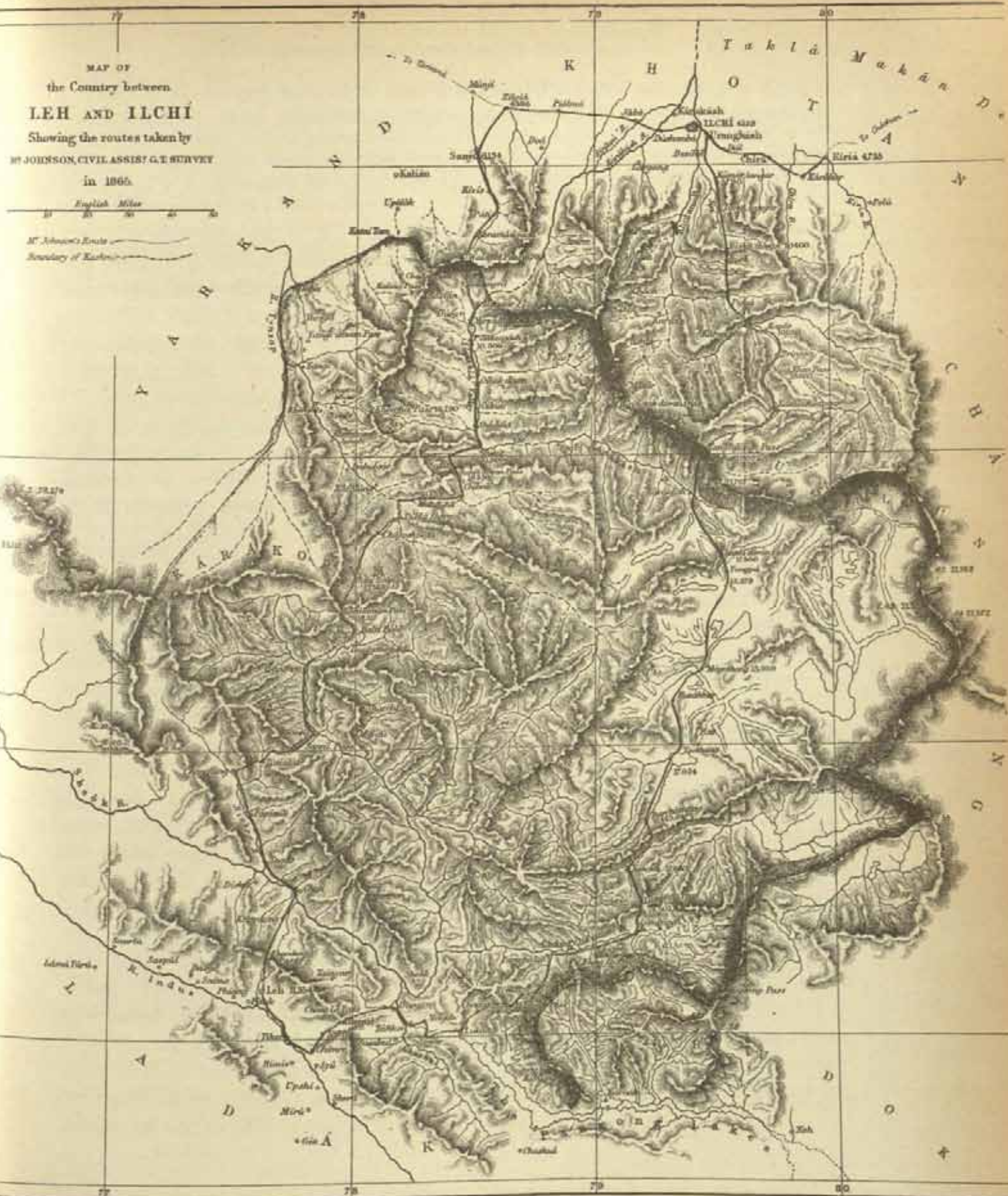
We now come to the important journey of W. H. JOHNSON across our mountain system to Khotan, in 1865.¹ He started from Leh and went through Chang-chenmo and followed an eastern road over Aksai-chin to Khotan, and returned by Sanju and the ordinary road of the Kara-korum Pass. Only ADOLPH SCHLAGINTWEIT had proceeded so far before him, though he did not visit the city of Khotan itself. The greatest importance of his journey consisted in the political and commercial information he brought back from Eastern Turkestan. On his map, Pl. LIV, he has drawn a very considerable meridional range at $80\frac{1}{2}^{\circ}$ East long., which in his opinion, is not only a geographical boundary line between the high plateaux of Chang-tang in the east and the more complicated mountainous country between the Kara-korum and Kwen-lun in the west, — but also a political frontier between Tibet and the Maharaja of Kashmir. The great Kara-korum Range on his map comes to an end not far east of the Kara-korum Pass in a labyrinth of small irregular ranges, where no great orographical lines can be traced. The Kwen-lun is marked as one very definite principal range, from which several ramifications issue to both sides. On the whole, and as Johnson could not know any details of the Schlagintweits' journeys, his map must be said to be comparatively good for 1865.

Johnson touched the west end of Panggong-tso, crossed the Másimik² Pass to Pamchalan (= Pamsal) in Chang-chenmo, and went up this valley to Kiam and Lumkang. The Lumkang Pass was found to be situated in a range forming the northern boundary of the Chang-chenmo valley. On Johnson's map this valley originates from the above-mentioned meridional range. His Lumkang Pass must be equivalent to Chang-lung-yogma, being on the watershed (19,501 feet) between the Indus and the Tibetan plateau-land. He gives a good description of the country beyond the pass:

I then marched in a northerly direction on high extensive table-lands, which might be called plains in comparison with the rugged ranges of the Himalayas, for they have

¹ *Report on his Journey to Ilchi, the Capital of Khotan, in Chinese Tartary* by W. H. Johnson. *Journal Royal Geographical Society*. Vol. 37. 1867, p. 1 *et seq.*

² In quotations I always use the authors' spelling of the names.



Published for the Journal of the Royal Geographical Society by J. Murray, Albemarle Street, London, 1867

Johnson's map, 1865.

a greater extent of level than of hilly ground, and the hills are low and have easy slopes The first plain is about 17,300 feet above the sea-level, it bears traces of having been the bed of a large lake and at present contains two lakes, which, when I saw them, covered areas of about 16 and 60 square miles resp. A second plain slopes for a distance of 30 miles in a north-easterly direction from 16,700 feet down to 15,300, when it rises again towards the watershed of the Kiun Lun.

To the east and S. E. other plains continued far away into Tibet. To the west were deep valleys belonging to the Kara-kash River. Reckoned from the point where he crossed this river, its sources were about 25 miles S. E. on the southern side of the Kwen-lun. From these sources the Kwen-lun was said to continue about 100 miles to the east and terminate in an extensive plain, communicating with the Chang-tang plain.

Finally he crossed the Kwen-lun in the Yangi Diwan (= davan), 19,092 feet, and had a difficult road to Ilchi. Of the different roads he tells us:

The usual route from Leh to Ilchi is over the Kárakoram Pass, and through Sanjú, but there are several others, which, however, have not been much used till very lately, *viz*: the Hindoták diwán, the Brinjga diwán, and the Polú route. The last of these is the best, as it lies over vast plains, where water, grass, and wood are obtainable at every halting-place.

This may be the same road which later on was used by FORSYTH'S Pundit and by DUTREUIL DE RHINS. It is, no doubt, easier ground, but longer than the ordinary Kara-korum Pass road. The Hindotak road is reported to branch off to the E. N. E. from Sukit (Suget) on the ordinary Kara-korum Pass road. It can only be used by foot passengers »on account of very difficult and extensive glaciers on the northern side of the pass«.

His own road Johnson calls the Brinjgá route, »over immense plains perfectly uninhabited and void of all vegetation« The whole country is covered over with a deposit of saltpetre and soda to the depth of from six inches to a foot; »the plains have once been the beds of three vast lakes, judging from the water-marks and banks which are distinctly visible«. Masses of snow and ice make the Brinjga passes difficult; one of them was 18,660 feet. From the sources of the Kara-kash there is another road to Khotan over Shahidullah, following the river the whole way and being passable only in winter. The routes chiefly used by traders from Leh to Yarkand are those *viâ* Kugiár, Kalián and Sanjú, the last two being closed in winter. He recommends the Rudok-Chang-tang-Polu road, which he supposed could be reached even from Almora, *viâ* the Niti Pass and Gartok.

On his way back he travelled through the lower spurs of the Kwen-lun to Sanju, crossed the Walágót Pass (16,760) which was the first Kwen-lun Pass, then the Suget-davan (18,227) and finally the Kara-korum Pass, to which he gives an altitude of 18,317 feet.

At the end of his article he has some interesting remarks on his different itineraries. The Yangi-davan is in the main range of the Kwen-lun. The Naiá Khán-davan (18,659) is also in the Kiunlun Range of mountains, which are, for the most part, very rugged and steep, and are composed chiefly of loose shingle, with granite rocks above.

Of the Kumdan glaciers he has only a very short notice:

The route from Gapshan passes some large glaciers, and lies down the right bank of the Sheók River, till its junction with the above-mentioned stream, whence it ascends to Sarsil. This route travelled over by me from Balti Púlú is called the 'Khumádán', and can only be used in winter, when the water in the river is frozen. There is another route from Balti-Púlú to Sarsil from the Depsang Plains, but it is only used in summer, on account of the cold in these plains being very severe in winter.¹

However short, this annotation is very valuable, as it proves that the Kumdan road was open in 1865 and that the glaciers did not proceed so far as to close the valley. When he says that he passed some large glaciers and followed the right bank of the Shayok, it is obvious that the glaciers did not even reach the river bank and that he did not touch the ice at all. The glaciers must have been in a state of considerable retreat in 1865.

In later years some doubts have been cast on the reliability of JOHNSON'S altitudes. Dr. W. HUNTER WORKMAN did not believe that Johnson, who was an employé of the Indian Survey, had camped at an altitude of 22,000 feet on his journey, 1865, in the Kwen-lun, though this had been asserted several times. There was no mention of it in Johnson's own publications, but if it were true it must have been on E 61, which was the only peak in the region exceeding 22,000 feet, *viz.* 23,890 feet as measured by a Survey employé in 1862. The measurement was unchecked and not endorsed by the Survey, as it was considered to be some 1000 feet too high. Any camp of Johnson on that mountain would, therefore, have to be lowered by the same amount.² The place alluded to in Johnson's account of his journey runs thus: »I ascended three peaks of the Kíun Lun Range, which had been previously fixed by the trigonometrical operations of the Survey, and which, having no names, are known by us as E 57, E 58 and E 61.»³

Mr. T. G. LONGSTAFF answered to Dr. Workman's criticism, that Johnson indeed »spent a night at over 22,000 feet in the Kuen Lun when surveying beyond the Chang-chenmo in 1864».⁴ Under the heading: *Mr. Johnson's Ascent of E 61* the same author says: »Johnson's high camp was made in 1864, on his way to the

¹ The name Sarsil of Johnson reminds us of Goës' Sarcil, though, of course, the two names have nothing to do with each other.

² *Geogr. Journal.* Vol. XXXI. 1908, p. 26.

³ *Journ. Roy. Geogr. Soc.* Vol. 37. 1867, p. 2.

⁴ *Geogr. Journ.* Loc. cit., p. 41.

Yarkand road from the neighbourhood of the Shayok River. He ascended E 61, many miles further to the east, in 1865 in the course of his celebrated journey to Ilchi.»¹ He also points to the fact that on STEIN'S map in the *Geogr. Journal*, Dec. 1902, the peak of Johnson, E 61, appears as Muztagh, with an altitude of 23,890 feet.

In the *Alpine Journal* of the same year Dr. Longstaff, entered the question at greater length.² He reminds us of the fact that W. H. Johnson was a member of the Indian Survey Staff, and worked, in Kashmir, 1860—65.

Very weighty evidence must be required, therefore, to upset his identification of the actual points which he reached. It is one thing to say of a 'mere mountaineer' that he mistook his position or his peak, and quite another to suggest this of a professional surveyor. As a matter of fact, I believe no one has as yet questioned Johnson's identifications of the peaks he climbed in 1865 from the Kuen-Luen plains.

Longstaff quotes the very favorable opinion of MONTGOMERIE and other authorities (R. G. S.) regarding the important services Johnson had rendered to geography.³ General J. T. WALKER, on the other hand, suppressed the official reference to Johnson's ascent of E 61. It was the statement of Johnson's ascending to 23,890 that was suppressed, but the *ascent* of the peak was not questioned. The question is, therefore, the *height* of E 61. Longstaff claims that Johnson indeed has ascended the three Kuen-lun peaks. It is only the altitude of the highest of the three peaks that is disputed.

On his memorable journey, 1900—1901, M. A. STEIN tried in vain to get information about the road to the south, the same by which JOHNSON appeared to have come.

At the same time the serious and very puzzling discrepancies I discovered between the sketchmap of Mr. Johnson's route and the actual orography of the mountains south of Pisha convinced me that I could not dispense with local guidance.⁴

Of this passage Longstaff says:

»He is rather severe (p. 214) on Johnson's hurried sketch-map of the northern slopes of these ranges, of which he had only had bird's-eye views but bears out Johnson's general description of the country.» However, the height of Johnson's peak was officially accepted as 23,890 feet. And it was obvious from Stein's account »that the Kuen-luen Muztagh, the ascent of which by Johnson does not appear to have been disputed, is the culminating point of a range containing six measured peaks of over 23,000 ft.» He concludes: »Until the Kuen-Luen Muztagh is remeasured

¹ *Ibidem*, p. 345.

² *A Note on W. H. Johnson's Ascents in the Kuen-Luen. Alpine Journal.* May 1908, Vol. XXIV, p. 133 *et seq.*

³ Montgomerie, however, regarded Johnson's survey in this region as merely »a rough sketch». — *Journ. Roy. Geo. Soc.* Vol. 41. 1871, p. 140.

⁴ *Sand-buried Ruins of Khotan.* London MCMIII, p. 214.

by some thoroughly competent observer, I see no way of avoiding the admission of Johnson's ascent in 1865 of a peak 23,890 feet in height.»¹

In the narrative of his journey, 1906—1908, Stein returns to the question: »Our explorations of 1900 had revealed very puzzling discrepancies between the sketch-map illustrating Johnson's journey and the actual orography of this region....»² He, however, now heard the name Brinjaga which actually figured in Johnson's route sketch. He goes on saying:³

Six years before I had been greatly puzzled by the topographical features of the sketchmap illustrating the route which Johnson claimed to have followed on his descent to Khotan in 1865. According to this map Johnson had made his way across the Kunlun main range by a very high pass, which he called 'Yangi diwan' (i. e. 'Yangi Dawan', the New'), to an affluent of the Yurung-kash and thence by a second pass, designated as 'Naia Khan Pass', to another valley joining the main river from the south close to Karanghu-tagh. — It was true that the position assigned to the latter as well as other topographical features were found to differ widely from the actual configuration of these valleys as revealed by our survey, while none of the names of passes, etc., shown south of Karanghu-tagh were known to the hill-men. No help could be got from the very meagre record published of Johnson's remarkable feat. There was no reason to doubt the general fact of his having crossed the Kun-lun main range from the head-waters of the Kara-kash southwards,⁴ and it was thus a matter of considerable interest to ascertain where his actual route lay.

The great discrepancy between Johnson's map and the real topography, therefore, only allowed conjectures. The »New Pass» of 19,500 feet by which Johnson »claimed to have penetrated the great barrier of the main Kun-lun» appeared »mysterious» to Stein. Of his survey of the Busai valley on the north side of the Kwen-lun, and not far from the place where Yangi-davan ought to be situated Stein says:

¹ *Alpine Journal*. Loc. cit., p. 137. At another place Stein says: »The sketch-map by which Johnson illustrated his journey (1865) from the Upper Kara-Kash to Khotan (see *J. R. Geogr. Soc.*, 1867, p. 1) cannot be reconciled with the true topography of the region from Karanghu-tagh southwards. In it the hamlet of Karanghu-tagh appears shifted some twenty miles farther north than its real position, and the Yurung-kash river is given a wholly impossible course. By the insertion of a great bend, which in reality does not exist, the valley of the Yurung-kash is shown in this map again some twenty miles south of Karanghu-tagh, i. e. approximately in its true position, but with the river flowing to the south-east, a direction exactly opposite to the true one. In this second portion of the valley a locality called Khushlash-langar is marked at a map-distance of some twenty-three miles to the south of Karanghu-tagh. In reality the few huts known by that name are situated only one and a half miles to the south-east of Karanghu-tagh, half way between the village and the left bank of the Yurung-kash. A strange kind of duplication seems to have occurred in Johnson's map, for which I am unable to offer a satisfactory explanation. Of the other local names recorded on Johnson's route from the Kara-kash to Karanghu-tagh, some are unknown to the Taghliks and some are applied to localities in an entirely different situation. All these discrepancies are the more puzzling since Johnson was a professional topographer who even without the use of a plane table could have secured an approximately correct record of whatever route he actually followed.» *Ancient Khotan*. Oxford 1907, p. 129, note 22.

² *Ruins of Desert Cathay*. London 1912. Vol. I, p. 181.

³ Op. cit., p. 198.

⁴ Johnson crossed the Kwen-lun from the Kara-kash northwards, for on his eastern route he travelled from south to north.

But our reconnaissances of the previous days had sufficed to convince me that this valley offered no possible outlet south or south-eastwards which Johnson could have used with yak transport. Trained mountaineers from Europe might indeed make their way over more than one col I had sighted on the crest overhanging the glacier to the south-east. But for load-carrying men, let alone yaks, the barrier was quite impassable.¹

The Kitai Diwan Pass of Johnson is entered on Stein's map II, but the identification seems not to be quite sure, for he says: »But certain features, due as it proved afterwards to erroneous sketching, still effectively interfered with any clear identification.»² For this pass Johnson has 17,500 and Stein 16,500 feet. Stone-cairns indicated that the road across the pass had been used.

In spite of the defence given to Mr. Johnson and in spite of the fact that very weighty evidence must be required to suggest of a professional surveyor that he could mistake his position or his peak, it must be said that his excursion to E 61 seems very doubtful. In his paper, quoted above, which is the single report of his journey at my disposal, he only states the fact that he has ascended the three peaks. »From these peaks, however, I could not get a view of any of the important towns of Khotan, which I was so anxious to see», which is easy to understand as the distance is 85 miles. From his camp on the Kara-kash River he despatched a messenger to Khotan, who returned after 20 days. »While waiting at the Kárákash for a reply to my letter, I employed myself in visiting several peaks, in order to fit sufficient points on the plane table for extending the work across the Kiun Lun Range, and in taking observations for determining the rate of my watch.» Further: »From the encampment of Brinjgá the road follows down a ravine for one march and then crosses over numerous passes and streams, including the Khotan River, which is crossed by a wooden bridge, till it gets into the plains of Khotan near Beziliá.» The latitude of Khotan is nearly correct. At the point where the Khotan River flows from east to west (on Johnson's map even S. W.), and where he crossed it, the latitude is $36^{\circ} 26'$. On Stein's map the east-west flowing part of the river is at $35^{\circ} 50'$.

In the text there is not a word about the experiences on the difficult and interesting journey from Kara-kash to E 61, and on the map there is no red line showing the route, which in a straight line is given as 52 miles. But regarding the easy and uninteresting excursion from Khotan to Keriya, which is only 33 miles as the crow flies, there is both a red line on the map and at least a few words in the text, saying:

During my stay at the capital of Khotan I employed myself in extending my researches, by making a hasty journey to the town of Kiriá, situated about 40 miles east of Ilchí. I rode there in one day, on horses posted for me by the Khán, spent a day there, and returned on the third, having meanwhile left my things at Ilchí.

¹ Op. cit., p. 204.

² Op. cit., Vol. II, p. 469.

On Johnson's map E 57 has an altitude of 21,767 feet, and E 58 21,971. These are probably identical with Stein's peaks of 21,750 and 21,960 feet, and here both maps agree tolerably. The two peaks are situated quite near the Camp of Kara-kash, the height of which is given as 15,491 feet,¹ and two ascents of resp. 6,276 and 6,480 feet would not be too much for a trained surveyor who had 20 days at his disposal. This lapse of time would also be sufficient for an additional excursion of 50 miles to E 61 and an ascent of its 8,399 feet above Kara-kash.

Provided that E 61 is identical with Stein's Muztagh (K 5), as has been maintained, both having an altitude of 23,890 feet, and provided that the part of the Yurung-kash which is dotted on Stein's map is approximately correct, there is no physical possibility to travel from the Kara-kash camp of Johnson to E 61 without crossing the Yurung-kash. Neither is it possible for a man who by some curious roundabout way to 82° east has reached the top of E 61, to be quite blind to the existence of the enormously deep-cut valley of the river just below his feet and to the south of his standpoint. But on Johnson's map there is no sign of the Yurung-kash, except to the north of the Muztagh Range of the Kwen-lun.² Therefore, and as Johnson was known to be a very able surveyor, and as it would be absurd to doubt the correctness of Stein's map, there remains only one way of explaining the puzzle, and that is that Johnson never ascended E 61 or Muztagh. The general discrepancies of his map of which Stein speaks are far more serious. He makes, for instance, the uppermost Yurung-kash flow from west to east, north of the Kwen-lun ridge; in reality it flows from east to west, south of the same range. From his E 61 he has drawn straight south a mighty meridional mountain range between 36° and 35° North. lat. in a region where the ground, to a traveller from the west to the east, is perfectly level. This and other facts do not in the least diminish the value of his courageous feat, and mistakes are made even by the best trained explorers.

¹ Stein has only 14,695 feet.

² Saunders, on his very well made map of 1877, had, of course, nothing else to do than accept Johnson's orography and hydrography. Cf. Vol. III, Pl. XXI. Nay, even on the map in *Stielers Hand-Atlas for 1901* (Vol. III, Pl. XXIX) it remained. Only on the sheet of 1904 (Vol. III, Pl. XXX) the new discoveries were entered.

CHAPTER XXIX.

ROBERT SHAW.

The famous and noble Captain T. G. MONTGOMERIE in 1863 started his brilliant work in sending out natives to unknown parts of the countries north of India. »While I was in Ladak,» he says, »I noticed that natives of India passed freely backwards and forwards between Ladak and Yarkund, and it consequently occurred to me that it might be possible to make the exploration by their means.»¹ He addressed the Asiatic Society of Bengal with reference to this plan and got a favourable answer.

Montgomerie first of all would have a route survey from Leh to Yarkand, and as the inhabitants there were known chiefly to be Mohammedans, he selected a Mohammedan munshi called MAHOMED-I-HAMID, who started from Kashmir June 12th 1863, and reached Yarkand September 30th, the same year. He was equipped with a pocket sextant, artificial horizon, prismatic compass, pocket compass, thermometers, watches, boiling point thermometers, etc.

The munshi died on his way back, but Montgomerie was able to draw a sketch map of his observations. He also got valuable information about Eastern Turkestan. In the route-survey it is noted that the Kara-kash River joins the Suget River not far below Suget. It is reported by Montgomerie that »the country was surveyed for several marches beyond the Karakorum Pass, and a rough reconnaissance was made of the Suget Valley between the Karakorum and the mountains above Khotan».

Otherwise the report does not contain much of interest. On the little diagram of Montgomerie we find that Mahomed-i-Hamid crossed the Shayok only twice, the second time when coming down from the Saser Pass. Thence he went the eastern, or Murghu road *via* Dapsang to the Kara-korum Pass. This seems to indicate that the western, or Kumdan route was closed by the glacier snouts in 1863.

¹ *On the Geographical Position of Yarkund, and some other places in Central Asia. Journal Royal Geographical Society.* Vol. 36, 1866, p. 157 *et seq.* With a diagram of the route between Leh and Yarkand.

Already in 1866 the Royal Geographical Society could congratulate themselves on the fine and indefatigable work of Sir ANDREW WAUGH and his assistants, a work which had carried the survey over a considerable part of the country, from the frontier of India up to the Kara-korum, the territorial limit of Kashmir. »The attempt to go beyond that point was discouraged by the Government, for fear of leading to political complications.»

Captain H. H. GODWIN-AUSTEN, who already in 1861 and 1862 had accomplished such important work in the Kara-korum, during the summer of 1863, filled up another blank — in the district of Panggong-tso. He also expressed in clear words some facts that formerly were only partly known. North of the Indus, he says,¹ from its junction with the Dras River, lies a high range of mountains which separate the Indus drainage from that of the Shayok or Nubra River. The axis and great mass of this range is granitic. Of the several passes leading over it into the Shayok valley, the Chang-la has an elevation of 17,470 and the Kay-la 18,250 feet.

Above Durgo (Drugub) he found large accumulations of alluvial sands and shingle that are seen along the large valleys of these mountains. Again his perspicacious eye observed many signs of climatic changes. The powerful force that had accumulated these materials was now extinct. Their formation and subsequent denudation was, however, as yet but little understood. The level of the plateau above Drugub »could be traced across the valley in and out of its numerous ravines in a perfectly horizontal line of a different colour, where very small portions of the alluvium still adhered to the slopes and precipices.» He estimates their thickness at the junction of the Tanksi and Drugub Rivers at 1500 or 2000 feet. In the valley of Muglib he found unmistakable signs of its having been the bed of a lake.

The low pass of Surtokh is the watershed between the Panggong-tso and Shayok and is formed entirely by loose shingle from a southern lateral ravine. If Panggong-tso had an effluent as formerly when the surrounding glaciers were double their present size, the talus would be swept away; now it is growing higher every year. A rise of 150 feet in the waters of the present lake would be sufficient to give them an exit down the valley of Tanksi.

Old shore-lines and lines of old beaches in sandbeds proved unmistakably that the lake had been higher at earlier epochs, and myriads of fresh-water shells, *Limnæa* and *Planorbis*, proved that the water had been fresh. He thinks the lake existed during the latter part of the great glacial period in the Himalayas.

Whether the scooping out of the depression in which its waters lie is due to glacial action in the first instance, when this high region was, as is most probable, deeply overlaid by ice and snow, is a hazardous question, and one highly problematical. From the

¹ *Journal Royal Geographical Society*, Vol. 37, 1867, p. 343 *et seq.*

alteration of the beds of débris and finer deposits, we can infer that there have been milder and moister seasons than at present exist, back to colder and drier.

With greater rainfall and a lower snowline, now above 20,000 feet, the former effluent from the lake should again cut through the Surtokh-la. A terrace 10 feet below the present surface of the lake proved to Godwin-Austen that there had been a drier period in former times. The snowfall in the Himalaya must be less now than formerly, and the country passing through a period of diminishing falls. The only deduction Godwin-Austen can make from such comparatively recent changes is, that the level of the lake has been alternating with moist and dry periods of time, the slow process of which may be even now going on almost imperceptibly to man.

In later years this theory has been worked out by other scholars in a way which proves that Godwin-Austen was perfectly right.

He remarks that the Kara-korum glaciers are the only remaining rests of such enormous glaciers which in ages past must have occupied the Himalayan valleys, where *striae* can be seen 150 or 200 feet high. And when glaciers extended down to 5,000 feet, he wonders what must have been the appearances of the Upper Shayok, Indus and Chang-chenmo, where 12,000 feet is the lowest level of the country.

Godwin-Austen supposes that the Panggong-tso is excessively deep, where the rocks go straight down. »It would be a most interesting scientific enquiry to sound the depth of this lake.« This wish should be fulfilled by subsequent travellers.

As a matter of fact very little was known regarding the Kara-korum System at this period. In 1866 Colonel YULE put together some longitudes assigned in the maps at his disposal to some of the chief points, his object being to show »how uncertain is still the basis of any map connecting the regions on the different sides of the Bolor, Karakorum, and T'ien Shan Ranges«.¹

In the following words Yule expresses his views regarding the course of the main feeder of the Yarkand River.

According to Moorcroft's information, probably derived from Izzetoolah' (see *J. R. G. S.*, vol. 1, p. 245), this rises in the north face of the Karakorum Pass, and flows in a northerly (north-westerly) direction to a point where it receives drainage from the (Eastern) Sarikul, and the Bolor Mountains, and then turns east (north-east) towards Yarkand. But, according to the best interpretation I can put upon the Chinese Hydrography translated by Julien (*N. Ann. des Voyages* 1846, III, 23 *seqq.*), the river rising in Karakorum, which I take to be that there termed Tingosapuho, only joins the stream from Karchu and Sarikul below Yarkand.²

A few extracts from T. G. MONTGOMERIE'S Reports should be inserted here. In 1868 he says:

¹ *Cathay and the way thither*. Vol. I, p. 311.

² *Op. cit.*, p. 317.

»The Whor (or Hor) country is said to be due north of the district, and from information gathered elsewhere there is little doubt but that Whor (or Hor) is the Tibetan name for eastern Turkistan.» The district he speaks of is Jung Phaiyu. Pooyu was said to »take its name from some high snowy peaks which are probably those at the eastern end of the Kiun-Lun range». He was told the Aksai-Chin was sandy and gravelly and covered with brush-wood. The »term implies the great Chinese white desert or plain».

»No high peaks were seen to the east of the Chang-chenmo, Mr. JOHNSON having noticed from the peaks he ascended large plains to the east and south-east, which are believed to merge into the Chang-thang plains of Rudok. Whilst he also gathered that the Kiun-Lun range only ran about 100 miles east of the Karakash river and then terminated on an extensive plain also communicating with the Chang-thang plains.»

»The Pundit whilst marching from Rudok to Thok-Jalung saw no high peaks to the north or east, evidence which all tends to prove the existence of a large plain in that direction, the term Chang-thang meaning moreover the great plain.»

»According to modern maps this plain extends a great way east, nearly up to the end of the great wall of China near the city of Sewchoo....»¹

Less than a year later on, MONTGOMERIE reports:

One of the Pundits has carried a route-survey from Dunkhar, in British Spiti, across the upper part of Chumurti, to the south-east corner of Ladak, and thence by a new route to Rudok — the capital of the north-west part of Tibet — which had never before been seen by a surveyor.... From Rudok the Pundit advanced nearly due east, over an elevated plateau averaging more than 15,000 feet above the sea. From commanding points this plateau appeared to be of a dazzling white, extending as far as the Pundit could see, and confirming what he heard as to its great extent. The whiteness appeared to be due to some salt mixed with the soil. The plateau lies to the north of the great Aling-Kangri group of snowy peaks which was discovered during 1867; from all accounts it must extend very far to the east, either joining or running parallel with the great desert of Gobi; its general position is indicated under the name of the »Aksai-Chin or white desert», in my map of Turkestan.... The sources of the eastern or main branch of the Indus have been satisfactorily traced to the back of the Kailas Parbut, and a very high range to the north-east of that peak.²

Montgomerie had long had his eye on the triangular space, lying between the Indus and its great Kabul tributary, which is bounded on the north by the Hindu-kush and Mus-tagh Ranges. All information gathered so far had been uncertain and he, therefore, decided to send a surveying explorer quite across from Peshawar

¹ *Report on the Trans-Himalayan Explorations in connection with the Great Trigonometrical Survey of India during 1868.* By Major T. G. Montgomerie, R. E. In charge Trans-Himalaya Exploring parties. P. II.

² *The Operations of the Great Trigonometrical Survey of India.* In 1868—69, p. 19.

to Badakshan. He sent »the Havildar» by the Lahori Pass to Chitral and Faizabad, capital of Badakshan. Returning to Chitral he used the Dora Pass.

»This route survey», says Montgomerie, »with the peaks which were determined trigonometrically last season, may be said to have put into my hands the key of the geography of the whole of the unknown region which it was desirable to explore,» and he hopes to get a further opportunity of exploring the unknown country.¹

In 1871—72 Montgomerie in a new report says:

From Yarkand the explorations follow the route to the Kárákorum pass, and thence the connection is continued by the regular operations of this survey to the Panggong lake, and south to the Indus, where that river first enters Ladák near Demchok . . .

From the Panggong our explorers have extended the line by a traverse to Rudok, the capital of the Chinese districts of Panggong &c., and thence, over the very elevated plateaux north of the Great Aling-Gangri peaks, to the Thok-Jálung gold field, passing through a succession of gold and borax fields.²

In February 1870 ROBERT SHAW lectured to the Geographical Society on *A Visit to Yarkand and Kashgar*.³ He said that Eastern Turkestan was like a bay between two ranges: the Tianshan and the Himalaya. »Both converge towards one another as they run westwards, and are united by a cross-range, supporting the high plateau of Pamir.»

After the paper Sir HENRY RAWLINSON said that one of MONTGOMERIE'S Pundits had also explored what had hitherto been a sort of *terra incognita* to Europeans. He had travelled from the Indian frontier into the central desert, and had proved that from Rudok right to the wall of China there were no high mountains. »Thus, after leaving the Pangkong Lake a four-in-hand might be driven to Kashgar.» It is curious that such an absurd idea could be expressed so many years after the journeys of the SCHLAGINTWEITS and JOHNSON!

T. SAUNDERS, at the same occasion, thought that SHAW had erred with respect to the physical geography of the country he had crossed, in supposing that the Himalayas and the Kwen-lun were to be regarded as one system.

The mass of mountains to the north of India was upwards of 2000 miles in length, by 600 in breadth. It descended by steep slopes on all sides, by the Himalayas to the plains of India on the south, and by the Kwen-lun Mountains to the great desert of Gobi on the north. On the east it descended by equally steep slopes to the plains of China, and starting from that base the two ranges, the Kuen-lun and the Himalaya, met together as in an apex at the great mountain knot of Pusht-i-Khar, where they join the Hindoo Koosh Range. But eastward they were 600 miles apart, and he thought it was not

¹ *Gen. Rep. on the Oper. of the Gr. Tr. Sur. of India during 1870—71*, by Major T. G. Montgomerie, Dehra Doon, 1871, p. 23.

² *Gen. Rep. of the Gr. Tr. Sur. of India during 1871—72*, p. 18.

³ *Proceedings Royal Geographical Society*. Vol. XIV. 1869—70, p. 124 *et seq.*

to the advantage of systematic geography to consider as one range the whole extent of so vast a mass. It was far more convenient that the great range of the north should have its distinct designation, as well as the great range on the south. He had no doubt that the range on the north was as well defined on its interior base as the Himalayas. It was, therefore, correct to say that this vast mass was bounded by a great range on the south, a great range on the east, and a great range on the north.

The Kara-korum is not mentioned in this orography of Saunders. Instead of it he has the phantastic eastern range, which we already know,¹ and which he here makes equivalent to the Himalaya and Kwen-lun.

To this criticism SHAW answered: his reason for regarding the Kwen-lun and the Himalaya as belonging to one single system was, that the elevated belt of country over which he had travelled consisted of no fewer than eleven ridges, more or less parallel, separated by depressions, and he could not see why the last of those parallel ranges should be considered a distinct system any more than any of the other ranges.

This again should be compared with the results of the SCHLAGINTWEITS. It is true that one is lost in an uninterrupted world of mountains when travelling from Kashmir to Yarkand, and that the mountains only farther east separate from each other, forming more and more distinctly individual systems. But many years before 1870, the Kara-korum had been recognized as one separate system.

One year later we find how Col. WALKER thought:

Mr. Shaw was quite right in saying that the Kara-korum range was no range at all. At certain points its watershed is very low and very easily crossed. He believed that a counterpart to this would be found in what is called the Hindoo Koosh range, and he felt assured that there is no well-defined range where the Hindoo Koosh is represented to be.²

SHAW had, in a letter to MURCHISON, regarded as a »most interesting discovery« that there was no real range Kara-korum east of the Kara-korum Pass. To the west of the pass he talks of it as the Mustak Range. The natives know only a pass, not a range Kara-korum. »There is no continuous ridge dividing the waters of Southern and Central Asia.« The watershed describes the most irregular line in all points of the compass.³

»Farther east again to the north of Chang-Chenmo and Rudok, a distinct ridge seems to divide the waters.« It runs N. W.—S. E., and is pierced through by the Shayok and its feeders near 35° North. lat., the Shayok in the gorge which was choked up by the Koomdán Glacier. This range he regards as the true continuation of the Mustak Range.

We shall have to return to Shaw's views presently, but first we may consider some other results of his journey.⁴

¹ Vide Vol. III, p. 177 *et seq.* and Pl. XXI.

² *Proceedings R. G. S.* Vol. XV, 1870—71, p. 203.

³ *Ibidem*, p. 178.

⁴ *Loc. cit.*, p. 126.

He observed that the rivers of Western Tibet, instead of crossing the mountains at once, often run for several hundred miles in the longitudinal valleys between the chains and parallel with them, until at last, they pierce the mountain-barrier. This is particularly the case with the Indus, »which rising in Chinese territory, runs north-westward behind five ranges of the Himalayas until it reaches its turning-point, when it breaks through them all». Its five great tributaries imitate its example. On the north side of the great watershed he finds the same peculiarity repeated. Thus the Kara-kash River runs for 80 miles along the southern flank of the Kwen-lun Range, before it can escape through the gorge of Shahidullah by a sudden turn. »And the Yarkand River, rising near the Kara-korum Pass, makes a great sweep behind another portion of the same Kwen-lun Range before turning towards Yarkand.»

He noticed how the southern ranges were annually blocked with masses of snow, whereas the northern ranges in Ladak and Tibet received comparatively little. Therefore the traffic was scarcely interrupted in Tibet at elevations of 18,000 feet, while nearer India passes of only 11,000 feet could be blocked for many months. He also finds it natural that very few rain-clouds could penetrate beyond Tibet and over the high northern ranges into Turkestan.

Shaw regards Tibet as »a high barren plateau», and he asks: »but what lies beyond, on the further side of the barren gravel terrace? Is it supported on that side also by a wall of mountains, or does it slope gradually down to the general level, or does it stretch away for any great distance at the same high elevation, and with the same barren character?»¹

This question could be answered only for the western part; farther east the country was still unknown.

In 1867 Shaw went so far as to Ladak. He »entered upon the vast table-land of Tibet in the district called Roop shoo.» But his views as to the »table-land» seem really not to be very seriously meant as he adds, that Rupshu at first sight reminded him of the British soldier's impression of Abyssinia: »Well, if it is a table, it is a table with all the legs uppermost.»

In May, 1868, SHAW again travelled to Ladak, by Kulu and the Bara Lâcha Pass, and visited the Panggong-tso. Dr. CAYLEY, who was the first officer appointed by the British Government as a resident of Ladak to watch the execution of the reduction of custom duties, — had just been exploring so far as to the Kara-kash River.

Robert Shaw left Ladak in September, and took the road of Chang-la, Drugub, Tanksi, Panggong-tso, Marsimik-la. He correctly regards the Shayok as one of the sources of the Indus. »From the Karakorum Pass the Shayok runs nearly directly south towards Ladâk, but, meeting a great range of mountains, turns off

¹ *Visits to High Tartary, Yarkand and Kâshghar, etc.* London 1871, p. 2.

abruptly westward, and runs for a dozen marches parallel to the Indus, and only separated from it by this great range, which it finally bursts through, joining the main Indus in Baltistán.»

He met HAYWARD, who went up the Chang-chenmo, while Shaw travelled up the valley of the hot spring. Here he came across the difficult steep place, where ADOLPH SCHLAGINTWEIT had »built up a kind of sloping path-way». Crossing a pass, about 19,000 feet high, he entered the Lingzee-tang. Of Lak-zung he says: »This is the name of that curious set of valleys leading down from the high plain of Lingzee-tang into a lower one on the north. They are both over 16,000 feet above the sea.» He describes the country as a system of parallel ridges, with corresponding valleys running north-west to south-east, »of which the granite rocks form one». There is another system of valleys crossing this at right angles.

October 26th he reached a place called Tarldat. October 30th the plain is found to narrow into a valley which curves off to the N. W. with a low broken granite ridge on its north-eastern side. Beyond this ridge is the Kara-kash River, and beyond that a high steep shingly snow-topped range, the Kwen-lun. The next day he reached Kara-kash, and saw to the N. E. high snow mountains and glaciers; the course of the stream came down very steeply from there and he fancied the source of the river was near. He annotates that »Mr. Hayward afterwards struck the head of this stream about eighty miles up, and followed it down to this spot. He proved it to be the real head of the Kara-kash River, and that it offers a better route than that which I had taken across the high plains.»¹

When marching down the Kara-kash on November 2nd, Shaw found that the river was also fed by numerous hot springs. On the north side granite rocks prevailed. Then he continued to Shahidullah and finally crossed his eleventh pass since India, Sanju-davan.

In the summer of 1869 he undertook his return journey to India, crossed, June 18th, the Sanju-davan and went down to Kara-kash and Shahidullah.

The following passage, written from the road between Suget-davan and Chibra, going south, is of interest as compared with other opinions Shaw had expressed regarding the Kara-korum:

We had a full view of the high snow mountains opposite (Karakoram), of which we had been seeing more and more peaks ever since Chibra. Ascending the level of the table-land on our right, we saw a cut in the range south-south-west. This leads to the Karakoram Pass. Further to the left, snowy mountains come round (bordering the upper Kara-kash), getting more and more rounded, though still snow, till they meet the Kuen Lun or Sooget Range behind us. This range, a high snowy one, faces the Karakoram, being about parallel and more regular as we see the actual range, while of the Karakoram

¹ Op. cit., p. 96.

we only see the snowy buttresses, not the actual watershed The whole space to our left is a high irregular table-land, sloping up for thirty miles or so to the mountains to the east, which bound the upper Kara-kash.

From the S. E. an almost dry river bed joins the one from the Kara-korum Pass and goes N. W., forming the Yarkand River. The mountains, although he estimated them at 18,000 feet, looked like mere hills, on account of the elevation of the plateau from which they rise. At Chadir-tash north of the Kara-korum Pass he again parted with HAYWARD who went S. E.

Describing the slow rise to the Kara-korum Pass he has the following remarks of the range:

The so-called Karakoram Range might better be described as the raised edge of a basin, or the culminating part of an irregular plateau, than as a chain of mountains. The descent on the south side is greater, but you can hardly believe yourself to be on the watershed between the great river system which flows into the Indian Ocean and that which runs eastward towards China.

Again he remarks that the heights on the sides are like hills and there is no snow. A day's march south of the pass, however, you come to real glacier mountains. The Shayok rises »in a perfect ocean of ice; there are two glaciers which unite and overflow a large plain. There are the marks of a lake which has repeatedly been formed here by the glaciers blocking up the ravine below and which caused such devastation by the cataclysm of 1841.« As we know, the cataclysms of the Indus originated from quite another cause.

Shaw continued his way down through narrow gorges in what he calls the broken edge of the table-land. Then, after some fords, he gives us an important bit of information about the Kumdan-glaciers.¹

The most difficult of these fords was caused by a huge glacier called Koomdan, whose nose protruded from a side valley, with pinnacles and seracs, some of which were quite 200 feet high, glistening like sugar Some three miles below this, another glacier blocked the way. After careful examination we discovered that the passage was entirely closed for horses, as the ice had in the last three months (since the passage of one of my guides, three months before) advanced as far as the opposite cliffs, tremendous lime-stone precipices, while the river forced its way under it through a kind of tunnel.

He had to send his horses by a five days' way over the mountains, whilst he passed the glacier tongue with some of his servants. On the other side they were attacked by a sudden inundation but found refuge on a rock in mid-water. Thus the Kumdan road was nearly closed in 1869. In the upper course of the Shayok there are little heaps of débris on the river-terraces; they consist of slate rock.

Now the formation of the mountains in this neighbourhood is granite and gneiss, and slate is not met with till near the head of the river, some eighty miles up. The natives, when asked for an explanation of this, say that these heaps were brought down

¹ Op. cit., p. 433.

by the great flood on blocks of ice, which got stranded, and in melting, left the débris with which they had been charged.

Over the Saser Pass he reached inhabited country.

In spite of Shaw's not quite clear views regarding the Kara-korum Range, the latter is represented in very dark and sharp features on his map, Pl. LV.¹ There is no southern Kara-korum, only *one* single range, crossed by the passes Mus-tagh and Kara-koorum. No attention has, therefore, been paid to the discoveries of VIGNE, GODWIN-AUSTEN, and others regarding the High Kara-korum with the gigantic peaks and glaciers. He regards the Sanju-davan as situated on the northern crest of the Kwen-lun Mountains, — but it is surprising to read »Thian Shan Range» on the range south of it. From this Thian Shan Range his map has a range branching off east-north-east, which is the Kwen-lun, and another to the south-east, in which the Suget-davan is situated.

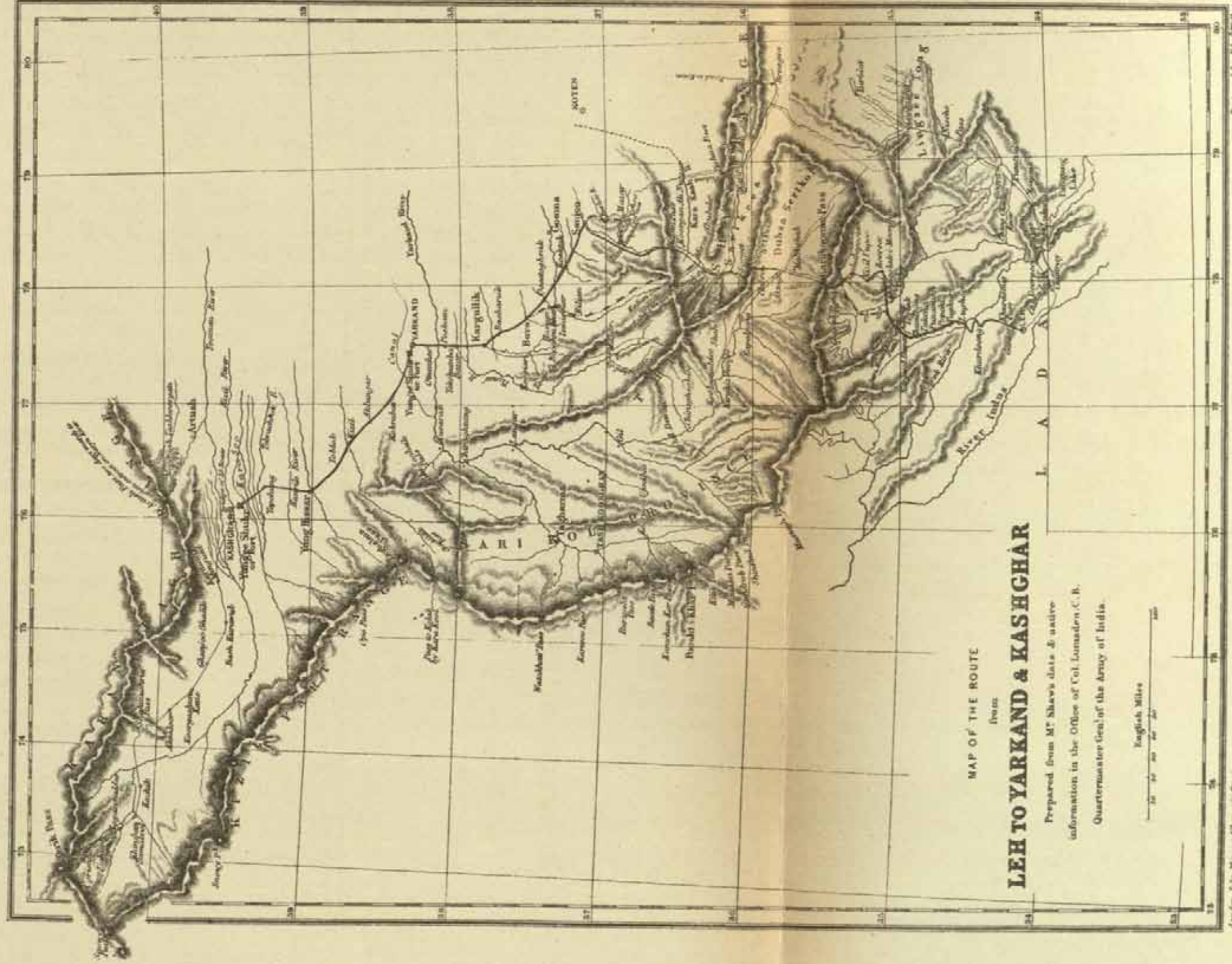
On the little Sketch Map of the Country north of India, at the end of Shaw's book, only the Kuen Lun or Koulkoun Mts. and the Himalaya Mountains are entered, but no Kara-korum. Here the influence of HUMBOLDT may be traced.

In the article *Central Asia in 1872*,² Robert Shaw, however expressed his views regarding the »great revolution» which had recently taken place in our ideas of the mountain-systems of Central Asia. He gives a short *résumé* of HUMBOLDT'S views, but recent observers, both British and Russian, were inclined to alter the arrangement.

With regard to the unity of the Kwen-lun with the rest of the Himalaya, Shaw had seen it and could testify to it. His reasoning is this: if you go up into the mountains, you are to consider yourself as being in the same chain until you come down again. Therefore certainly the Kwen-lun and the Himalaya are one. The fact that you cross several parallel ranges and ridges does not interfere. He does not find any reason why the Kwen-lun should be called a separate chain. If the Oberland is a part of the Alps, then the Kwen-lun is a part of the Himalaya. He tells us of a sportsman, Captain SKINNER, who went to the upper Kara-kash and who left the Kara-korum Pass to the west, when he returned. In Leh he asked Shaw: »What has become of the Karakoram Range? it has vanished!» And Shaw adds: »Having thus abolished the Karakoram Chain, we may, I think, proceed to do the same with several others, and notably with Humboldt's Bolor or Belut-Tagh.» As to the city of Bolor, he leaves it to fade into the same mist of confusion as the Karakoram Range and the kingdom of Prester John. He denies the existence of Humboldt's north and south running Bolor Range, so much the more as »it is

¹ *Map of the Route from Leh to Yarkand & Kashghar prepared from Mr. Shaw's data & native information.*

² *Proceedings Royal Geographical Society.* Vol. XVI. 1872, p. 395 *et seq.*



now known that the loftiest ridges of the Pamir region run more nearly east and west. Such is the line of mighty peaks seen by Hayward and myself from Káshghar, and of which the culminating point is called by the natives Taghálma.»

Shaw seems to have suffered from a real mania for abolishing mountain ranges. The most northern flank of the Himalaya mass has been called the Kwen-lun. »At one time it was thought that this Kuen-lun constituted a separate and continuous range running in an unbroken line almost into China.» From near the Upper Indus gold-fields, on the south, up to the parallel of Charchan, on the north, considerable eastward-running streams had been reported to exist. Shaw settles the difficulty as follows: »Now, this is the very region where geographers formerly wished to place a continuous snowy Range of Kuen-lun, also running east and west. It is probable, however, that such a range would shed its waters north-wards; and I think we may gather from the facts I have stated that the country sinks towards the east, and that no continuous snowy range maintains its elevation in that direction.» From natives he had heard »that the whole country is passable in every direction, and only not frequented by travellers because no business takes them that way». Shaw, therefore, thinks it probable that the Kwen-lun farther east is replaced by »vast irregular high plateaux draining eastward, and which must also diminish in height to the northward, in order to attain the lower levels of the deserts of Takla-Makán, and Gobi».

It makes a rather surprising impression to read that General STRACHEY, after this paper could say, that recent exploration »had altogether confirmed the conclusions arrived at by him twenty years ago».¹ He and his brother had found the same general unity of the great mass of mountains that existed between India and Central Asia, as Mr. Shaw had found. He agreed with him that the Himalayas and the Kwen-lun were simply the southern and northern borders of the same mass of elevated land; »but there was certainly no special range, in the sense in which the word was commonly used, as implying an elevated mass with an equal ascent and descent on either side, which could probably be designated as Himalaya, Kuen Luen, Bolor &c.»

Fortunately Mr. SAUNDERS saved the situation in regretting at having to differ from SHAW'S views when he obliterated the Kuen-lun. »Was not the Kuen Luen, then, a range of mountains as much as those seen from the valley of the Ganges? He did not deny that they were parts of the same elevated mass, but, as that mass had a breadth of 600 miles, it was desirable to distinguish its different parts by distinct names.» He also contended for a distinct application of the name Kara-korum Mountains. The rise to the Kara-korum might be very slight, but still the

¹ *Ibidem*, p. 407.

Kara-korum water-parting performed a distinct function, separating the basin of the Indus from that of the Tarim. He asked what such a water-parting should be called and why it should not be regarded as a range, when its summits reached an elevation of 28,000 feet?

This discussion took place only some fifteen years after the SCHLAGINTWEIT'S journeys! And JOHNSON'S map had been published in the *Journal*!

SHAW'S article *Central Asia in 1872* was translated by PETERMANN.¹ He points out that recent English and Russian exploration had brought forward a quite new theory of the arrangement of the mountains of these regions. The Bolor-tagh was regarded as a north-western continuation of the Himalaya, the Kara-korum and Kwen-lun were joined with the Himalayas into one great mountain system. And instead of our imaginations of sharply defined water-parting ranges, we get great mountain masses and high plateaux on the top of which the peaks and series of crests were built up. In spite of SAUNDERS' criticism, PETERMANN agrees with SHAW, MONTGOMERIE, SEVERTSOFF and others who reckon Bolor-tagh, Kwen-lun and Kara-korum in the Himalayan System. He thinks Shaw was right in giving a greater and more natural importance to the enormous upheavals of the plateau-masses than to the more artificial representation hitherto given by the maps.

The geographers of those days did not know the many other systems in the interior of Tibet and which, notwithstanding the plateaux, are very distinct, and can not be called peaks built up on a plateau-land. It should not be forgotten that the original, primary orography may, on account of innumerable periods of climatic changes and the always acting denudation, be hidden by the secondary phenomena, to which belong the filling up of basins and the transformation of valleys into plateaux.

The famous Bolor falls outside of our region, and we have no space here to enter upon Sir HENRY YULE'S very valuable and learned discussion of the name, to which he was lead by Shaw's information that the Kirgiz used to give the name Bolor to Chitral. Yule follows the history of this name which has played such an important part in maps and geographical works and up to 1870 has been so misleading, not least on account of HUMBOLDT'S unrivalled authority. It is sufficient for us to quote Yule's final result:²

Bolor, it may be hoped, is now finally disposed of. We not only know that there is no such place where it was located, but we can also now account for the error. The name Bolor is, I see, still used by recent geographers for the Pamir Mountains. But the name has been so tainted, both by accidental error and by forgery, that it would surely now be well to dismiss it from our maps and books altogether.

¹ *Petermanns Mittheilungen*. Band 19, p. 1 *et seq.*

² *Journal Royal Geographical Society*. Vol. XLII. 1872, p. 473 *et seq.*

The general character of the great highlands north of India was a puzzle to geographers fifty years ago. JOHNSON reported the existence of an open road from Ilchi around the eastern extremity of the Kwen-lun Mountains, by which wheeled carriages could pass from the Himalayas direct into the plains of Central Asia. MOORCROFT had already told us: »The trade between Hindoostan and Khotan was formerly very extensive; and it is even said, though I presume rather figuratively, that a loaded cart could go all the way from Nugeebad to Sureekee (Sarik-kia), in the mountains of Khotan. The road from Sureekee towards Hindoostan is reported to have passed by Rudokh and Gurkh-dokh, (Gartok).»¹ To this Sir Henry Yule, who was more clear-sighted than other geographers of his time, remarked:² »The details of Moorcroft's information on this matter were probably incorrect, for it does not seem consistent with ascertained facts, as exhibited in Col. Walker's map, that there should be a road passable for carts from Rudokh, on the plains of Chang-thang, to the Karakash River.»

In 1868 Sir HENRY RAWLINSON did not believe in any Russian danger »from beyond the chains of the Kuen-lun and Kara-korum», to which he adds the Hindu-kush. »Although the routes over these chains may be perfectly practicable for commerce, they are quite impracticable to the march of an army, not on account of physical difficulties, but from the want of supplies.»³

A few years later Sir Henry recognizes the unity of the entire mass, and writes that the whole country between India and Tartary may be considered as a broad mountain range, the Himalaya forming the southern crest, and the Kwen-lun the northern.⁴ When speaking of the PUNDIT'S journey to Tengri-nor, Sir Henry, the same year, presumed that the lofty mountains north of Tengri-nor were the eastern prolongation of the Kwen-lun.⁵

In his article: *A Prince of Kâshgar on the Geography of Eastern Turkestan*,⁶ SHAW expresses some very clever views regarding the orography.

He says of MIRZA HAIDAR:

Our author evidently considers all that lies between Yârkand and Khotan on the one side, and India on the other, as one great mountain-mass; in the same way as that which divides Yârkand from Badakhshân, or Kâshghar from Khokand, only, the mass widens as it runs round by south and east. He is not troubled by any theories about the mountains of Sanju (the Kuen-Lun) not forming a part of the same mass. This mass is composed of many subordinate ridges, but they combine to form one grand system. No one of these subordinate ridges or ranges (such as the so-called Kuen-Lun) deserves to be

¹ *Journal Royal Geographical Society*. Vol. I. 1830—31, p. 243.

² *Proceedings Royal Geographical Society*. Vol. XIII. 1868—69, p. 304.

³ *Proceedings Royal Geographical Society*. Vol. XIII. 1868—69, p. 19.

⁴ *England and Russia in the East*. London 1875, p. 236.

⁵ *Journal Royal Geographical Society*. Vol. XLV. 1875, p. CXCII.

⁶ *Journal Royal Geographical Society*. Vol. XLVI. 1876, p. 277 *et seq.*

distinguished from the general system, in any sense in which each of the others could not equally be distinguished from the rest. Looked at individually, they are ranges distinct from one another, but viewed *en masse*, they all (including the Kuen-Lun) form but one system or chain.

I have shown above¹ that Mirza Haidar's orography, which is the object of Shaw's article, very well coincides with the Chinese conception of the Ts'ung-ling. And it may well be regarded as a merit both of the Chinese and of Mirza Haidar that they have a clear sense for generalisation in the orography. But their views are neither so high, nor so finely developed as those of European geographers, and it seems surprising that such a clever and intelligent man as Shaw could take the Oriental standpoint, though he has seen the whole country with his own eyes. It also sounds unexpected that he should call the Kuen-lun, one of the mightiest mountain-systems on the earth, a »subordinate ridge». But to a certain extent he may be said to be right when he joins the whole lot of ranges and systems and combines them into *one grand system*. His meaning is the same as if he should say: there is only *one* ocean on the earth, but, of course, the Atlantic and the Indian Ocean are distinct from one another.

He is less lucky in the comparison he makes between the Sarik-kol Ranges and the Mus-tagh Mountains:

I think we should consider the mountains on the east of the Pâmir plateau, not as a range lying roughly north and south, and cut through by the rivers (as is the case with the continuation of the Mustak Range south of Karakoram), but rather as a series of more or less parallel ridges, whose direction is roughly east and west, and between which the eastward drainage of the Pâmir plateau escapes.

Shaw thinks the »so-called Karakoram Range» has no »*locus standi*».

It has before been shown that further *east*, the water-parting represented by that name on the maps is not even a ridge, but that many of the streams running into the Indus on one side, and into the Turkistân rivers on the other, originate close together on open (though elevated) plains. But now it would seem that even directly *west* of the Karakoram Pass we may ride across on a level from sources that feed the Indus into others which join the Yarkand River. The little ridge of Karakoram, therefore, is cut off on both sides, and has no physical connection with the mighty Muztak Range and its peaks of 28,000 feet of elevation, on which it has wrongly imposed its name in European maps, though never in the minds or speech of the natives.

The identification of the Mustagh Range with the Kara-korum Range is erroneous, according to Shaw, for a road leading from Baltistan across a high glacier pass of the Mustagh Range, on the other side is still *south* of the Kara-korum.

The truth is, that while the Muztak Range coincides with the water-parting between the Indus and Yarkand rivers as far east as the seventy-seventh degree of longitude (about), from that point eastward the range and the water-parting are divorced; the former continued its previous direction with its mighty snow-peaks and glaciers, running across the

¹ P. 15, *supra*.

headwaters of the Shayok, which pierce it through narrow, often almost tunnel-like, gorges; while the latter (the water-parting) turns off to the north-east across the high Karakoram plateau, winding about among the hills which stud its surface, sometimes coinciding for a short distance with a ridge, and forming an imaginary line across the elevated plains.

He rightly does not believe in the possibility of constructing a railway across the Kara-korum, the scheme of which had been discussed at that time.

He quite agrees with SEVERTSOFF'S views as expressed in his paper in the *J. R. G. S.* 1870. Shaw finds that the manner of transition of the Himalaya System into the Tian-shan System »is like that of a willow-wand which is bent almost double without breaking».

In Sir CLEMENTS MARKHAM'S geographical paper there took place, in 1877 and 1878, an interesting controversy between SHAW and SAUNDERS regarding the Kara-korum. I have already considered Saunders' article of 1877. In his answer¹ to this, Shaw sharply maintains the difference between a range, which is a physical feature, and a water-parting which is only a function. He puts the question: »Is the water-parting between the Lob Basin, and the Indus Basin, throughout formed by a range of mountains or no?»

So far as the western part of the water-parting is concerned, Shaw agrees with Saunders who fixed it on the Mus-tagh Range. About its eastern continuation, from Nubra and eastwards, they disagree. In Shaw's opinion Saunders is wrong in making the Kara-korum the southern limit of the Tibetan plateau; for, going south from the sources of the East Turkestan rivers, you are still on the Tibetan plateau, and Saunders ignores the range which is broken through by the headwaters of the Shayok.

Shaw quotes Dr. SCULLY who noticed that he had crossed the mighty snow range of Mus-tagh, and then, after arriving at the northern side of it, asks: »but where is the Kara-korum Range?» He finds some support in Dr. THOMSON'S description also. Saunders, on the other hand, is simply looking on the maps and, joining the sources of the Turkestan rivers, calls such a line the Kara-korum. In opposition to Saunders, Shaw maintains that the Mus-tagh is a range in spite of several rivers breaking through it.

Shaw says that at the beginning of the Eastern Mus-tagh this range is divorced from the water-parting, which goes farther north and in which the Kara-korum Pass is situated. The mistake of Saunders is, he says, that he makes this water-parting a range and a continuation of the Western Mus-tagh. Saunders' three arguments for the Kara-korum Range being also a water-parting, are answered and refuted in a very clever way by Shaw in spite of the »limited vision of the observer on the spot», of which Saunders, strange enough, had been talking. In Shaw's opinion the

¹ *Geographical Magazine*. Vol. IV. 1877, p. 314.

Kara-korum would never have been called a range, had it not been the divide of two important basins.

He concludes that Saunders' view would be correct if it had been said that the water-parting was situated on the plateau, and that the boundaries of the plateau, Kuen-lun and Muz-tagh, were broken through by the rivers rising on the plateau. »My protest (in which I should have expected Mr. Saunders' support) is raised against the practice of tracing out on the map a line dividing the headwaters of the streams belonging to separate basins and then assuming that along that line, and there only, runs a range.»

On the Kara-koram mountains was the title of an article in which SAUNDERS answered SHAW.¹ Here he proves that the name Mus-tagh should not be used instead of Kara-korum, which belongs to the whole system. Shaw's Eastern Mus-tag he prefers to treat as a secondary feature, whereas the water-parting is the main axis of the system. Saunders' Kara-korum Range terminates at the head of the Karakash River.

It should be remembered that the eastern end of the Kara-koram lies between the headwaters of the Karakash and those which feed the lakes and swamps of the Lingzethung Plain, where the Gangri system begins. It is the connection of the Gangri system with the Karakoram that Mr. Shaw is invited to solve, so as to connect his Mustak with it in a symmetrical manner.

It was a mistake of the time and a mistake which existed still in 1910 that one could talk at all of the eastern end of the Kara-korum. And it is absurd to call the Lingzitang a kind of boundary mark between the Kara-korum and the Gangri System, *i. e.* Transhimalaya. Still, it is a very sound and clever thought Saunders expressed in putting up as a desideratum the settling of the question whether or not the Transhimalaya is connected with the Kara-korum. This is indeed the case with the southern Kara-korum, whereas the northern is connected with the Tang-la.

Shaw again replies.² He defends his views and proves that the Kara-korum cannot possibly be at the same time the name of the water-parting on the plateau, and of the range which is the south-western boundary of that plateau.

If Mr. Saunders desires a systematic nomenclature for the actual facts of that region, I offer him the Karakoram plateau (a subdivision of the Tibetan plateau), bounded by the Kuen-lun range on the north-east, and by the Eastern Muzták on the south-west, both of which are penetrated by the streams rising on the plateau on either side of the Karakoram water-parting which is in places marked by a ridge and in places unmarked and almost imperceptible on the open plains of the table-land. How and where the south-western boundary range and the water-parting coalesce further east in the Gangri range, which

¹ *Geographical Magazine*. Vol. V. 1878, p. 20.

² *The Kara-koram. Geographical Magazine*. Vol. V. 1878, p. 126.

seems to be both bounding range and water-parting, is a question which I have not investigated. But I do not know that this fact invalidates my observations of the Kara-korum region.

This is a very honest and correct statement. He had no materials and could not possibly have any views whatever regarding the connection of the Gangri Range. It was certainly only from Saunders' map he had got the impression that the »Gangri Range« was both boundary range and water-parting, which is exactly what it is not. Shaw was too serious an observer in the field to accept as real facts mountains that had been constructed in London.

In a new article, *The Karakorum Mountains*,¹ SAUNDERS would not give up his ground. It is not necessary for his purpose that there should be a coincidence between the culminating summits and the water-parting — inclusive of the Kara-korum Pass. He defines the Kara-korum Mountains as the mass which forms the water-parting between Lop and Indus. »Its extremities are found where the water-parting of the Indus ceases to be conterminous with that of Lake Lob.« To the east they continue in the Gangri Mountains, to the west in the Hindu-kush. The absurdity of this definition is easier to see nowadays than it was then. For the northern Kara-korum continues eastwards through the whole of Tibet without having anything whatever to do with the water-partings of Lop-nor and the Indus.

The northern base of the Kara-korum Mountains, Saunders places at the sources of the Yarkand-darya and the Kara-kash, and the southern base is part of the Upper Indus. He agrees that perhaps some people should prefer to regard the range between the lower Shayok and the Indus as a separate system, but he thinks this view is wrong. It was, however, right. He maintains that the whole system should be called the Kara-korum System.

The controversy between Shaw and Saunders could not lead to any satisfactory results as both defended their grounds, and the former was talking of mountains he knew insufficiently, the latter of things he did not know from personal experience.

However, the ideas of Shaw were comprehensive and seducing, and we have seen that many of the great geographers of the time followed him. He denied the existence of a Kara-korum Range, and felt sure that the Kara-korum would never have been called a range had it not been a water-parting between Lop-nor and the Indian Ocean. Only *one* continuous mass of elevated land filled up the space between India and Eastern Turkestan, Himalaya and Kwen-lun being its border ranges. The Tibetan plateaux were sloping to the east and north.

General STRACHEY, PETERMANN, MONTGOMERIE, SEVERTSOFF, RAWLINSON and others agreed with SHAW regarding the Bolor-tagh, Kwen-lun, and Kara-korum

¹ *Geographical Magazine*. Vol. V. 1878, p. 186.

as parts of the Himalayan System. The last-mentioned spoke of a broad mountain range between India and Tartary, Himalaya being its southern, Kwen-lun its northern crest, thus creating the gigantic monster of *one* range with *two* crests. SAUNDERS wisely pointed out that the Kwen-lun *was* a range just as well as the Himalaya, and he could not see why a mountain with peaks of 28,000 feet in altitude should not be called a range.

None of the rest had ever written such classical words as the following by Shaw:

Once across the Bara Lâcha Pass . . . (or any other pass of the same range), you enter a region where all gorges or valleys appear to have been filled up by an encroaching sea of gravel, which has risen to within a few hundred feet of the summits of the ranges. The space between the mountains no longer plunges down into a seemingly bottomless ravine, whose sides narrow down till they barely leave room for the stream. Instead of that it is occupied by a broad high-level plain, out of which the summit ranges merely rise like undulations. We notice the prevalence of the *horizontal*, after the *vertical* lines to which the Himâlaya has accustomed us. It is like leaving a Gothic cathedral, and approaching the Parthenon. At the same time, a kind of drought seems to have fallen over the face of the country. There are no vast fields of snow to supply streams of water, and no frequent showers to maintain verdure.¹

In these few graphic and eloquent words Robert Shaw gives us the very cream of the problem, and the fundamental characteristics of the most majestic building on the earth's crust. He also proves to be an unusually intelligent observer quite familiar with the great physical changes, which since millions of years have been, and still to-day are going on between India and Eastern Turkestan. If a man of such great merits enunciates what in his opinion is a general morphological truth, one has to listen to him. And disregarding the genetic points of view, the geological stratification and the historical building up of these immense mountain systems, only devoting our attention to the goal at which the destroying and depositing forces are aiming, he *may* be said to be right. But as long as the erosion is active the goal will never be reached. And therefore we have to take the Tibetan high plateaux and their gigantic mountain systems such as they are at present.

¹ *Visits to High Tartary, etc.*, p. 62.

CHAPTER XXX.

J. W. HAYWARD.

Reviewing the results of MONTGOMERIE'S Pundits for 1867, PETERMANN mentions amongst their discoveries: die Aling Kangri-Gipfel, nördlich vom Indus, 23 bis 24,000 Fuss ü. d. M. Sie scheint eine Fortsetzung der Kette zwischen dem Indus und dem Pangkong-See zu sein.¹ On the map this peak is situated on the N. W.—S. E. stretching range Chomorang. Herewith is another attempt made in the right direction, regarding the Aling-gangri as a link in the Transhimalayan and Southern Kara-korum System.

In a very remarkable article which was translated into English, the famous Russian explorer and scientist N. SEVERTSOFF, slightly touched upon the connection of the Tian-shan with the Bolor, Ts'ung-ling and Himalaya.² He identifies the Western Tian-shan with the Northern Ts'ung-ling. Or rather, the mountain mass of Ts'ung-ling is formed by the conjunction of two enormous ranges, the Tian-shan and Himalaya. A separate Bolor, as a mountain system, does not exist. He attaches this name to the mysterious river and town which we remember from VENIUKOFF'S paper. He found that in the part of the Western Tian-shan which he visited, the same N. W. to S. E. stretching of strata was recognized as in the Himalaya. Again he says:³ »Arguing from the data we at present possess respecting the Central Asiatic mountain region (i. e. the Tsun-lin of the ancient Chinese), the Bolor, in the sense of a distinct range, does not exist; and mountains so called ought to be classed with the Himalayan system.« He regards the Ts'ung-ling as formed by the intersection of the Tian-shan System with elevations from the Himalayas. Further he says⁴ that Veniukoff had stated the Bolor belonged to the Himalayan System. In a note he expresses his views as follows:

¹ *Erforschungsreise Indischer Geodäten (Panditen) nach den Goldfeldern von Tibet, 1867. Petermanns Mitteilungen, 1869, p. 103.*

² *A Journey to the Western portion of the Thian-Shan or Tsun-Lin, etc. Journal Royal Geographical Society. Vol. XL. 1870, p. 343 et seq.*

³ *Ibidem, p. 387.*

⁴ *Ibidem, p. 391.*

Apparently that marked distinction between the systems of the Bolor, Kuen-lun, Himalayas and Hindoo-kush, which is pointed out by Humboldt, does not actually exist. The three first appear merged, as it were, into one common elevation, the axis of which stretches from north-west to south-east. According to the measurements of Schlagintweit, the highest range in this elevation is the central one of the Kara-korum, the Himalayas, and the Kuen-Lun; the marginal ranges of the general elevation are lower, but have a direction from west to east. At Nepaul detached peaks of the Himalayas do rise above the Kara-korum, though the Himalayan Range does not exceed the latter in its general height. As far as the sources of the Indus, the Himalayan system, i. e. the elevations on both sides of the Kara-korum, presents, according to Cunningham's map, two different directions of mountain chains, the principal ones being north-western and south-eastern ranges, lying north-east and south-west, which directions are similar to those in the Bolor Mountains The Bolor is not a distinct meridional range, but merely a north-western continuation of the Himalayas, or, more correctly, of the Himalayan branch of the Tsun-lin, which is a gigantic convexity, connecting, by means of gradual transitions, the system of the Thian-Shan with that of the Himalayas.

SEVERTSOFF states that HUMBOLDT'S five mountain systems: Altai, Tian-shan, Kwen-lun, Himalaya and Bolor, according to more recent exploration had been reduced to three: Altai, Tian-shan and Himalaya. In this opinion we recognize SHAW'S view, for he made the Kwen-lun, Kara-korum and Himalaya into one single system. Humboldt's view was more correct than Severtsoff's improvement. Humboldt's system was too simple, although Severtsoff, on Shaw's authority, made it still simpler. To use a German word, the *Gebirgsgliederung* is much more complicated than was believed in those days.

R. MICHELL in his article on *The Russian Expedition to the Alai and Pamir*, however, finds certain resemblances between HUMBOLDT'S system and HAYWARD'S meridional range. He says:

Humboldt drew his continuous line of mountains from the Himalayas to the Thian-Shan, in a direction from S. S. E. to N. N. W. From the meridian of Yarkand this is indeed the direction of Lieut. Hayward's «Kizyl-Yart Range»; and this is as much a watershed between Eastern and Western Turkestan as the ridge which the Pundit Manphul has appropriately termed the Pamir range; but the Pundit's range runs in a direction from S. S. W. to N. N. E.; and taken separately under its distinctive name, it might more correctly be said to bound the Pamir Steppes on the south-east, Hayward's range being clearly their eastern limit in the north.

The name Kizyl-Yart does not, however, appear to be applicable to Hayward's Meridional Range, and would seem properly to attach only to a red ridge, and to a pass in the latitudinal Alai Mountains, which Fedchenko has called the Trans-Alais; although Captain Trotter also observes that that is the name by which the range in question is known to the Kashgarians.¹

PETERMANN compares SEVERTSOFF'S views with others of the time.² In the report of the Trans-Himalayan Explorations 1869 it seems as if MONTGOMERIE

¹ *Journal R. G. S.* Vol. 47. 1877, p. 17 *et seq.*

² *Petermanns Mittheilungen.* 1872, p. 167.

regarded the Bolor as a continuation of the Mus-tagh or Kara-korum. When SHAW denied the existence of any Kara-korum Range at all, WALKER carried Shaw's view a step further, extending it also to the western Hindu-kush.¹ Petermann finds the results of Russian exploration in accordance with those of the British.

We now come to the important exploration of J. W. HAYWARD, of whom Sir RODERICK MURCHISON could communicate to the Royal Geographical Society that he, after having been kept almost as a prisoner at Shahidullah, contrived to escape, and crossed the mountain ranges at the sources of the Yarkand-darya. During that expedition he made great additions to our geographical knowledge, demonstrated the true course of the Yarkand-darya and the Kara-kash, reached, at the northern slopes of the Kara-korum, the sources of the Yarkand-darya and obtained information about the Yangi-davan over the Kwen-lun.² Hayward also explored Yasin, Gilgit and Hunsar-Nagar. In the summer of 1870 he was murdered at Darkut by the governor of Yasin, Mir Wali. In this connection we have only to consider the Kara-korum part of his travels.

Hayward knew three different roads between Leh and Yarkand:³ 1. The winter route along the Shayok River to the Kara-korum Pass. 2. The summer route, over the Kardong Pass (17,574), crossing the Shayok, ascending the Nubra River, crossing the Saser Pass (17,972), joining, at Murghu, the winter route, continuing to the Kara-korum Pass (18,317). At Ak-tagh they again separate: the winter route goes down the Yarkand River, and crosses Yangi-davan to Kok-yar; the summer route crosses the Ak-tagh Range by the Suget-davan (18,237), and joins the Kara-kash River four miles above Shahidullah; the Kilian Range has then to be crossed by either the Kullik, Kilian or Sanju passes. 3. From Leh *via* Chang-chenmo and the Chang Lang Pass (18,839) and across the high plains lying between Chang-chenmo and the Kwen-lun Range, below which it enters the valley of Kara-kash to Shahidullah.

Hayward left Leh September 29th, 1868, and took the way over Chang-la, Marsimik-la, Pamsal and Gogra. The Chang Lang or Chang Chenmo Pass he calls the easiest of all passes leading across the Kara-korum and Hindu-kush Ranges. As he says it would be no great impediment for artillery, it cannot be the same as my Chang-lung-yogma, which is practically impassable for any kind of artillery. But he is right in saying it is situated in the main range of the Kara-korum. On the north side he camped at Nischu (Ni-chu), which proves that the pass he crossed must have been quite close to Chang-lung-yogma, for I camped also at Ni-chu.

¹ *Proceedings Royal Geographical Society*. Vol. XV. 1870—71, p. 203.

² *Journal Royal Geographical Society*. Vol. XL. 1870, p. CLXII.

³ *Journey from Leh to Yarkand and Kashgar, and Exploration of the Sources of the Yarkand River*. *Journal Royal Geographical Society*. Vol. XL. 1870, p. 33 *et seq.* and *Proceedings Roy. Geog. Soc.* Vol. XIV. Session 1869—70, p. 41 *et seq.*

The Ling-si-tang plains he found extending for 40 or 50 miles from N. W. to S. E. and 17,000 feet high. It was bounded to the south by the Kara-korum, and to the north by a lower range, Lak-tsung. After having crossed this range he reached another plain stretching north to the Kwen-lun. The desert Aksai-chin stretched eastwards. He got the impression that »the main chain of the Kuen Luen terminates as such, somewhat abruptly to the eastward, and at about the 82nd meridian radiates in lower spurs running down into the high table-land of the Aksai Chin.... A high range bounded the view at a distance of 80 miles to the S. E. This range — either the continuation of the main Karakoram Chain, or a spur from it — was visible, stretching from the head of Chang Chenmo, and trending with a direction of E. N. E. towards the spurs of the Kuen Luen to the eastward.» Hayward here is speaking of a secondary range of hills for the continuation of the great Northern Kara-korum takes a south-easterly direction.

He then turned westwards and crossed the Kisil-davan (17,859). His camp in Kisil-jilga was at the Upper Kara-kash, a place which formerly had been believed to belong to the Yarkand-darya. Here CROSBY and I have crossed Hayward's route at right angles.

The range to the west of the Upper Kara-kash, above Kisil-jilga, is the main Kara-korum and water-parting between the Shayok and Kara-kash. Probably Hayward's Thaldat (15,896) with a »spring and ice-bed«, is identical with my Camp 300, so much the more as he mentions a considerable lake to the east.¹

He continued down the river, but as he was the first explorer in this region he could not yet know that it was the Kara-kash. From a point 19,500 feet high, and situated above his camp Kush-maidan, he saw »to the W. and S. the snowy chain of the Karakoram«, bounding the view, while northwards was the Kwen-lun.

Farther on the Kara-kash turned to the north, and then suddenly to the N. E. Hayward followed the river down. In the prolongation of its valley the snowy peaks of the Kwen-lun could be seen. The river turned N. W. and its valley was called Sarikia (Sarik-kiya) »evidently the Sarka of Moorcroft and the Chinese itineraries.« He found himself here »under the Kwen Luen Range«. Hayward proved that the Kara-kash had its source not in the Kwen-lun, but in the Kara-korum. Thus the view of JOHNSON, 1865, had been wrong. Seen from the south, the Kwen-lun looked very sharply marked. He passed Gul-bashem, a place which had been mentioned by MIR IZZET ULLAH. Hayward reached Shahidullah November 20th. He found its height to be 11,745 feet. Here the Suget route comes down, and the Kara-kash goes north piercing the main chain of the Kwen-lun and then turning

¹ Cf. my vol. IV, p. 221, and Pl. 16.

east. It should be noticed that Hayward did not reach the very source of the Kara-kash-darya, but ascertained where the river came from.

Hayward distinguishes between the Western Kwen-lun which is west of the Kara-kash valley (north of Shahidullah), and the Eastern Kwen-lun which is east of the same valley.

On November 26th, Hayward started westwards to the Kirgis-davan (17,093), from the top of which he could see the summits of Eastern Kwen-lun, as well as the Western Kwen-lun, the Kara-korum and the Mus-tagh. The Upper Yarkand-darya flowed in a longitudinal valley between the two principal ranges. The river came from the S. E. and then turned to the west. He describes the view as a grand scene of enormous mountains, snowy peaks and glaciers. On the northern side of the Western Kwen-lun rises Tisnaf, which he believes joins the Yarkand-darya. From the Mus-tagh Pass in the Kara-korum Range another river joins the Yarkand-darya.

The highest peak of Western Kwen-lun he gives as 22,374 feet high. He gives a picturesque description of the Kara-korum Range as seen from the north. »It is a stupendous mass of mountains, and glaciers are seen to the north as well.»

Having reached the farthest point down the Yarkand River, he returned up the valley and ascended a steep spur of the Kwen-lun. Five hours' hard climbing took him up to a commanding station.

Far away to the south and south-west stretched the high peaks and glaciers of the Karakoram and Muztâgh Range, some of whose loftiest summits attain the height of from 25,000 to 28,000 feet above the sea. One peak situated to the east of the Muztâgh Pass, reaches the stupendous elevation of 28,278 feet above sea-level, and is one of the highest mountains in the world. Beyond where the river sweeps out west, the snowy peaks above the Kunjoot country were in sight towards Sarikol. East and west extended the whole chain of the Kwen Luen and the Kilian Mountains, the last range to be crossed before the steppes and plains of Turkistan are reached, while immediately below lay the confined ravine up which the road ascends to the Yangi Pass, now full in sight beneath me. The extent of view of the main Kara-korum or Muztâgh Chain comprised a length of 200 miles, stretching from near the Karakoram Pass to the head of the Tashkurgân territory north of Hunza and Nagar.

After some important excursions he went up the Yarkand River. »On the afternoon of the 8th December I reached the source of the Yarkand River.» It was surrounded by high snowy peaks and glaciers. The place was 16,656 feet high, and a few miles to the N. W. of the Kara-korum Pass.

He gives this very sound definition:¹

The Karakoram Chain here (west of the Karakoram Pass) loses the great altitude to which it attains in that portion of the range lying between the Muztagh Pass and the source of the Yarkand River; and from here eastward, to beyond the Karakoram pass, is much broken The main range continues eastward beyond the Karakoram pass

¹ *Ibidem*, p. 60.

to where a remarkable double peak occurs in the Chain, and at this point throws out a somewhat irregular spur, named the Karatâgh, towards the Kuen-Luen, which forms the eastern crest of the high central plateau of Aktâgh. At this double peak the Karakoram range, after running with a general direction of E. S. E. from the Pusht-i-Khar, a distance of 320 miles, suddenly turns to the south, and, again rising into a lofty chain of snowy peaks considerably above 21,000 feet above sea-level, forms the watershed between the Shayok and Karakash rivers, until, in the parallel of $34^{\circ} 43' N.$, it trends again to the eastward, and runs along the head of Chang Chenmo; and here constitutes the southern crest of the elevated table-land known as the Lingzi Thung plains and the Aksai Chin.

Hayward then returned by the Suget-davan to Shahidullah. He further made the following important orographical and hydrographical discoveries:¹

Hitherto our maps have represented the Kara-koram and Kwen-lun to be one and the same great chain, whereas a distinct watershed and the Yarkand and Karakash rivers intervene between the two ranges. On the other hand, the Tiznâf River has been defined as rising in the Karakoram Pass, and flowing through the Kuen-Luen range to its junction with the Yarkand River, which stream has been represented to have its source at the head of the Sarikol territory, near the source of Wood's Oxus. This is entirely wrong. The Tiznâf is but a tributary of the Yarkand River, and rises on the northern slope of the Kuen Luen to the east of where the Yangi Pass crosses that range. — It would be satisfactory were a definite geographical name assigned to the great watershed dividing the basin of the Indus from the Turkistan rivers, and which is comprised in the great chain known, in the different portions of its length, as the Karakoram, Muztâgh, and more anciently Belortâgh, and Pololo. To the inhabitants of Eastern Turkistan, the whole chain is known as the Muztâgh Range, which in Turki means the »Glacier Mountain« or range; the word Karakoram being merely applied to the pass of that name. That the name Karakoram should be given to the range indefinitely is desirable for the sake of distinction and the Karakoram Range, as specified in the report, will be understood to refer to the whole mountain system, included in the chain stretching from the Pusht-i-Khar to the head of Chang-Chenmo.

The Sanju-davan (16,612) is situated in the Kilian range, which is a spur from the Western Kwen-lun and bounds the Kara-kash valley on the north.

Then Hayward says:

A cursory glance at the map suffices to show that the most direct route from the north-west provinces of India to Yarkand must, after reaching Chang-Chenmo, cross the main chains of the Karakoram and Kuen-Luen and the intervening high land of Aktâgh, in a general direction bearing N. N. W. I have endeavoured to show that the true road into Eastern Turkistan from Aktâgh is down the valley of the Yarkand River and across the Kuen-Luen Range by the Yangi Pass, and it remains to point out the most direct route by which Aktâgh can be reached from Chang Chenmo. This is the route we followed on our return; from the Chang Lang Pass leading across the Karakoram Range it traverses the western side of the Lingzi Thung plains, and entering the upper valley of the Karakash River, conducts down that valley and across the Karatâgh Pass of Aktâgh.

Finally we should remember these words, which, except for a few mistakes, are perfectly correct:²

¹ *Ibidem*, p. 65.

² *Ibidem*, p. 118.



The theory advanced by the explorers, the Schlagintweits and Johnson, would indicate a system in which the Kara-korum and Kuen-Luen ranges are the northern and southern crests of the same great chain, but the mountain system assigned by Humboldt to Central Asia, which divides them into great mountain chains, coinciding with parallels of latitude, is strictly the true one. Whether regarding the Karakoram as a separate chain, or as a prolongation of the Himalaya to the northward, it forms a distinct watershed between the Indus and the river-systems of Tartary or Eastern Turkistan, while the Kwen Luen constitutes a parallel chain bounding the high table-land of Tibet to the north. To the west of this elevated plateau or table-land the extensive tracts of level plain, which are its characteristic features, are no longer met with, for here they break into detached ranges, and the general level of the country sinks into the basin of the Turkistan rivers.

Thus Hayward showed that the Kara-korum and Kwen-lun were two separate systems which could not be joined as had been done since Humboldt's times. Further, it seems very likely that Hayward discovered the source of the Yarkand-darya and, although he did not reach the very source of the Kara-kash, he nearly determined its whereabouts.

His paper was illustrated by a beautiful map.¹ He has the Muztagh or Karakoram Mounts drawn as a mighty range running W. N. W.—E. S. E. with the three passes Shingshal, Muztag and Karakoram. It is shown as the great water-parting, both the Yarkand-darya and the Kara-kash having their sources on its northern side, while the Shayok and Nubra Rivers originate on the southern. The Western Kara-korum was in several details still conjectural. East of the Kara-kash River he has a Lak Tsung Range running W. N. W.—E. S. E. like the Kara-korum and nearly forming a continuation of it. His Kizil-Jilga on the Kara-kash River is certainly the same point as the Camp CCXCV, which I reached exactly 40 years later. For this point he has 16,192 feet or 4,936 m., I 5,088 m. Taldat, according to Hayward, is at a height of 15,896 feet or 4,846 m. whereas my camp CCC has 4,977 m.²

The lake east of Thaladat, on 80° Long. which is also on Johnson's map and probably had been seen by ADOLPH SCHLAGINTWEIT, is the Aksai-chin Lake as it may be called because of the lack of a better name. To the east of this lake Hayward has quite correctly made a gap in the meridional range of Johnson, for from Thaladat and somewhat farther south he could see the great open latitudinal valley stretching eastwards south of the Kwen-lun. The last-mentioned system he has represented as a sometimes double system parallel to the Kara-korum, and, to the south, sending considerable ramifications across the Tibetan plateau-land.

¹ *Sketch map of Eastern Turkistan showing the hydrography of the Pamir to the east, the true courses of the Yarkand and Karakash Rivers with all the routes from Ladak across the Karakoram and adjacent Ranges.* As drawn by the author Geo. J. W. Hayward. — Here reproduced as Pl. LVI.

² The difference is in the first case, 152 m., and in the second, 131 m. For Yarkand, Hayward has 1,167 m., where I found 1,272 m., the difference being 105 m. On Stieler's map of 1911, Yarkand has 1,270 m. Hayward's altitudes, therefore, seem to be 100 to 150 m. too low, the difference increasing with the height.

His journey was an extremely important step forwards in our knowledge of this very complicated world of mountains. He has hardly been surpassed by any subsequent traveller in this region, and clearer and more correctly than his predecessors, he drew up the principal lines of orography and hydrography north of the Kara-korum. Whilst SEVERTSOFF reduced HUMBOLDT'S systems into three, the Altai, the Tian-shan and the Himalaya, HAYWARD, both in words and maps emphasises that the Kwen-lun and the Kara-korum are two distinctly separated ranges. But Severtsoff had never seen the Kara-korum. Hayward wisely recommends the name Kara-korum for the whole system, though on his map he has also entered the older name, Muztagh, known from STRAHLENBERG'S map 135 years before. He distinguished between the Western and Eastern Kwen-lun, the Kara-kash River being the boundary, a distinction that could not be improved by PRSHEVALSKIY'S extraordinary »Russian Range» for the latter. A real and necessary improvement was, on the other hand, RICHTHOFEN'S division in the Western, the Central and the Eastern Kwen-lun, founded upon deeper knowledge of Chinese geographical literature. Asiatic exploration had to sustain a heavy and deplorable loss the day when Hayward was murdered in the midst of his successful work.

Even after Hayward's journey the spirit of HUMBOLDT still dominated the older geographers of the time. After Hayward's paper was read, Sir RODERICK MURCHISON said that Hayward's researches to a great extent sustained the broad views of Humboldt. In Humboldt's sketch-map of 1844¹ we see the Kwen-lun laid down as a distinct chain, separated from the Himalayan and Kara-korum chains on the south and from the Tian-shan on the north; in their western prolongation these chains are traversed by the Bolor, of which the high Pamir plateau forms the eastern edge.²

More surprising still is what Sir HENRY RAWLINSON said:

Baron Humboldt had always maintained that there were two great chains running through this part of Asia, and that where they approached each other they were connected by a transverse chain. Mr. Hayward had fully established the truth of that view, and had also shown that the rivers rising to the west of the transverse chain flowed towards the Oxus, while all those rising to the east flowed towards the centre of the Chinese Empire.³

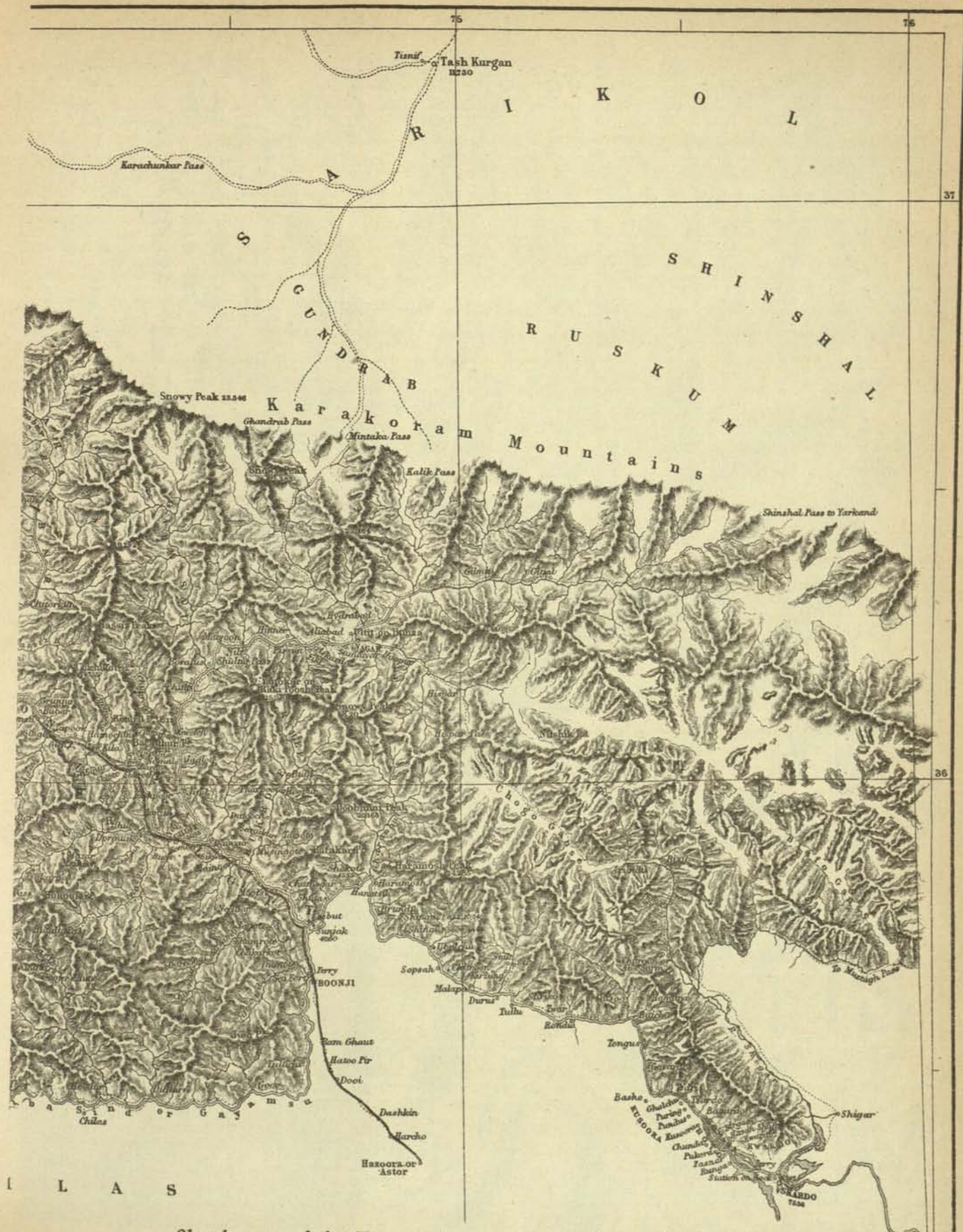
If Hayward had proved anything, it was that Humboldt's transverse ridge connecting the Kwen-lun, Kara-korum and Himalaya, did not exist in reality. And even D'ANVILLE knew that rivers rising here far in the west did not flow to the centre of China. The discussion proved that the speakers did not at all understand the importance of Hayward's journey.

A year later Hayward's last letters were published. They were written on his way from Astor up to Gilgit, Yasin and Darkote, where he met his fate. That

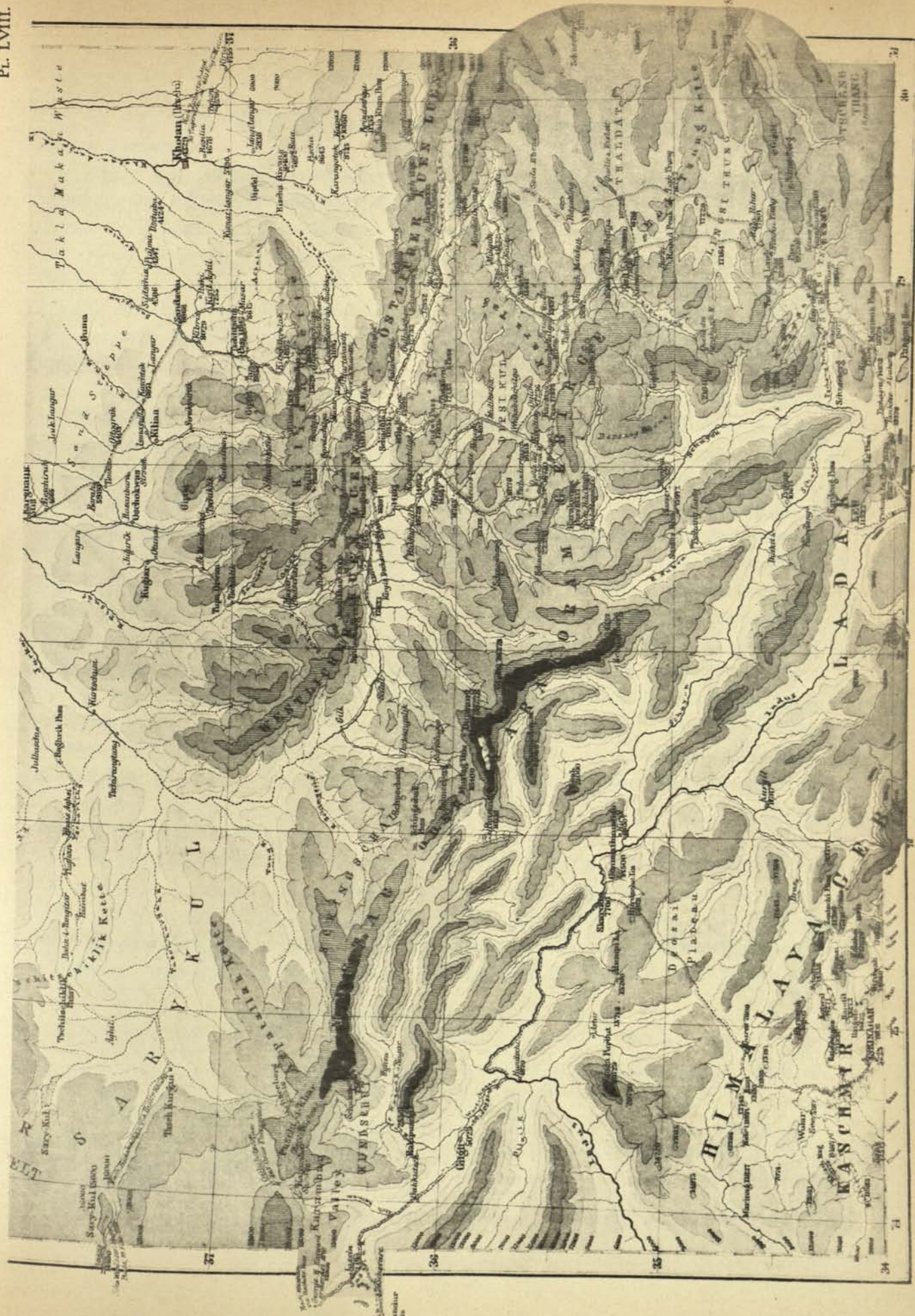
¹ *Vide Pl. XXXII, supra.*

² *Proceedings Royal Geographical Society.* Vol. XIV. 1869—70, p. 72 *et seq.*

³ *Ibidem*, p. 74.



Sketch map of the Trans-Indus countries, including Gilgit, Dilail, Yassin & C. By Geo. J. W. Hayward.



C. W. Hayward's Reise von Leh nach Kaschgar 1868—9 etc. von A. Petermann.

time he was south of the Kara-korum and far to the west of the Biafo and Chogo Ganse glaciers.¹

The map illustrating Hayward's letters has the title: *Sketch Map of the Trans-Indus Countries including Gilgit, Dilail, Yassin &c. by Geo. J. W. Hayward*, and is reproduced here as Pl. LVII. The Kara-korum is running W. N. W.—E. S. E. and is, in the west, in connection with the Hindu-kush. A series of passes well-known in our days, are entered. To the north of the range is Sarikol with Tash Kurgan and its river, the feeders of which cross the district of Gundrab, *i. e.* Khunserab. Later exploration would prove that the orography was more complicated in this region.

In his *Report of The Mirza's Exploration from Caubul to Kashgar*² Major MONTGOMERIE has given a very able *résumé* of what was known of these regions, although we do not need enter upon it here.³ He chiefly touches districts situated »beyond the Hindoo Koosh, Mustagh, and Karakoram ranges, which may be considered as a continuation of the great Himalayan system». The Mirza's route gives Montgomerie a determination of the great watershed which separates Eastern Turkestan from the basins of the Indus and the Oxus. He says: »This new determination confirms the opinion that I have held for many years, that the said watershed continues to run northwest from the Mustagh. — A conclusion which I came to from the positions of many gigantic peaks fixed by the survey to the north-west of the Mustagh, which peaks, though probably not on the watershed, doubtless indicate its general direction.» On the map illustrating his paper, Montgomerie has the Kara-korum Range as a very sharp ridge between the Mustagh Pass and the Kara-koram Pass.⁴ From the Mustagh Pass the Mustagh Range runs to the N. W. as an immediate continuation of, and just as sharply demarcated as, the Kara-korum. On this map also some of the ranges belonging to Eastern Pamir begin to make their appearance, and the days of the Bolor or Belur-tagh are gone.

In 1871 Dr. PETERMANN brought together all that was known of these regions and published an article: *Ost-Turkestan und seine Grenzgebirge, nach Hayward, Shaw, Forsyth und anderen neueren Reisenden*.⁵ Of special interest is the map of what he calls the grandest mountaintop in the world.⁶ It is a hypsometrical map in different colours for different heights. In the west he has the Kisil Yart Kette

¹ *Journal Royal Geographical Society*. Vol. XLI. 1871, p. 1 *et seq.*

² *Journal Royal Geographical Society*. Vol. XLI. 1871, p. 132 *et seq.*

³ *Cp.* Vol. VIII.

⁴ *Map of the route from Badakshan across the Pamir Steppe to Kashmir with the Southern branch of the Upper Oxus from the Survey made by the Mirza 1868—69. Vide* Vol. VIII.

⁵ *Petermanns Mitteilungen*, Band 17. 1871, p. 257 *et seq.*

⁶ *C. W. Hayward's Reise von Leh nach Kaschgar, 1868—69. Nach der Karte im Journ. R. G. S. Vol. XL. Nebst Übersicht der Höhenverhältnisse der Central-Asiatischen Gebirgs-Systeme von A. Petermann. 1:2,500,000. Vide* Pl. LVIII.

(Bolor Gebirge). To the south we see three different ranges: the Kilan range which is small, — south of it the Western and Eastern Kwen-lun separated from each other by the Kara-kash valley, and farther south the Mus-tagh or Kara-korum Range, which, at about 77° East. long., divides into three branches, one situated between Shayok and Nubra; the second is the branch with the Saser Pass, and the third is the principal watershed between the Shayok and Kara-kash. The Lak Tsung Range may be regarded as a fourth branch between Lingzi-tang and Taldat.

Much on this map is conjecture, but, in general, it gives a correct idea of the situation of the principal ranges and a very clear representation of the hydrography. It is also important as an station on the road of exploration, for it contains all material available in 1871.

The Punjab and its Dependencies with portions of the Northwest Provinces and Afghanistan, 1870; Compiled in the Office of the Surveyor General of India from the latest Surveys, is the title of a map quite up to date, and with all the great glaciers known at that time. The name Kara Koram Mountains is confined only to the part of the system where the Kara-korum Pass is situated. I have not reproduced it here.

Pl. LIX shows the relation which in 1862 was supposed to exist between the Kwen-lun and the Kara-korum.¹

¹ The title of this map is: *Rough Sketch of Caravan Routes through the Pamir Steppes and Yarkund, from information collected from Mahomed Ameen Yarkundi, late Guide to Messrs De Schlagintweit (S^d) P. S. Lumsden Murree 1862.*



Rough Sketch of Caravan Routes through the Pamir Steppes and Yarkund from information collected from Mahomed Ameen Yarkundi, late Guide to Mess:rs De Schlagintweit. Murree 1862.

CHAPTER XXXI.

FORSYTH'S FIRST AND SECOND MISSION.

I have referred to the erroneous opinion Sir HENRY RAWLINSON had of the highlands to the north of Himalaya. He regarded as the great discovery of JOHNSON, the existence of an open road from Khotan round the Kwen-lun over the Chang-tang, a road by which wheel carriages could pass from the Himalayas directly into the plains of Central Asia. The verification of the existence of that road was a desideratum in Asiatic exploration.

This view seemed first to be somewhat supported by FORSYTH'S statement that the Kara-korum road was almost the only one which had so far been used for trade. If the Chang-chenmo route could be used instead, all the difficult passes of the Kara-korum would be avoided. Instead of marching six days without any kind of grass for the animals, as over the Kara-korum, the tradesmen would find anything they needed if they took the Chang-chenmo route.¹

In spite of HAYWARD'S discoveries, Rawlinson still felt tempted to regard even the western part of the highland as an even plateau. For he says that SHAW and HAYWARD »had surmounted five different ranges in their journey across the *Himalayan plateau* between India and Turkestan.»²

But soon the cart-road had also to disappear, for in a letter to MURCHISON, FORSYTH says that the road to Charchan »skirts the foot of the Kuen Luen Range, which by all accounts, and certainly so far as we could see from the heights of Linzi Thung, extends far to the east, thus dispelling the notion that a cart-road could ever be found from Khotan to Ghartokh.»³

In another letter: *On the Transit of Tea from North-West India to Eastern Turkestan*, FORSYTH touches upon the futility of attempting to open up a trade

¹ *On trade Routes between Turkestan and India. Proceedings Royal Geographical Society.* Vol. XIII. 1868—69, p. 10 et seq.

² *Proceedings Royal Geographical Society.* Vol. XIV. 1869—70, p. 232.

³ *Proceedings Royal Geographical Society.* Vol. XV. 1870—71, p. 23.

route the ordinary way and reminds the Society that he had shown »how very easy the passage by the Changchenmo route really was».¹

T. DOUGLAS FORSYTH'S expeditions over our western mountains into Eastern Turkestan form an epoch in the history of exploration of these tracts. His first journey, a friendly visit to the Atalik Ghazi or Yakub Bek, took place in 1870 and only two Europeans, GEORGE HENDERSON and SHAW, accompanied him. The leader of the expedition was well prepared for his task. Visiting Leh in 1867, Forsyth could convince himself that for centuries a straggling kind of trade had been carried on through Kulu, Lahore and Spiti and over the Himalayas and Kara-korum between Eastern Turkestan and Panjab, and he found that there was every prospect of a fair trade reviving if the obstacles caused by oppression were removed. He even encouraged the Yarkandis by proclamations, and got himself an excellent support in Sir RODERICK MURCHISON.²

For our purpose it will be sufficient to follow HENDERSON'S description of the journey.³

In 1862, Mr. R. H. DAVIES' report on *The trade and Resources of the Countries on the North-western Frontier of British India*, showed that the trade between India and Eastern Turkestan was virtually barred by the excessive duties levied on goods in transit. The negotiations of Sir ROBERT MONTGOMERIE with the Kashmir Durbar resulted in a considerable reduction of the tariff on goods passing through the Kashmir territories. This was a stimulus to the trade on Eastern Turkestan and in 1867 Dr. CAYLAY was stationed at Leh during the summer. He was to make observations on the trade and how to encourage it. The attention of the authorities was drawn to the Chang-chenmo road, of which Henderson says that it »was believed to present fewer physical difficulties than the other route by the Karakorum». In 1869 he had seen men at Leh »who had crossed over from Yarkand by this route in the depth of winter; they described the road as almost free from snow, and practicable for laden horses the whole way, at all seasons; in this, it contrasts strongly with the old Karakoram route, which is quite impassable for half the year.»

In 1870 there followed the treaty between the British Government and the Maharaja of Kashmir. The Atalik Ghazi had the year before sent an envoy to the Viceroy of India, and in 1870 the Commissioner of the Jalandhar Division, T. DOUGLAS FORSYTH, was sent to the Atalik Ghazi.

July 3rd the expedition was joined at Leh by Mr. SHAW, and after necessary preparations, they started and went *viâ* Tikse, Jimre and Sakte to Chang-la which

¹ *Proceedings Royal Geographical Society*. Vol. XIII. 1868—69, p. 198.

² *Autobiography and Reminiscences of Sir Douglas Forsyth*. Edited by his daughter. London 1887, p. 43, *et seq.*

³ *Lahore to Yarkand. The Expedition of 1870 under T. D. Forsyth*. London 1873.

was crossed July 10th. Henderson knows three or four passes over the granite range to the north of the Leh valley: The Kardong north of the town of Leh, the Digar-la, a little farther east, and the Chang-la still farther east. As the fourth he regards the one used by Hayward, a few miles farther east.

From Leh to Muglib, granite predominated and in many of the valleys he observed deposits of clay and gravel of enormous depth, often 300 feet at least. Beyond Muglib he noticed white gypsum and slate.

About Panggong-tso he makes the same remarks as GODWIN-AUSTEN:¹

Many feet — in some places 70 feet — above the present surface-level of the water there are white deposits, consisting chiefly of lime, and containing spicula of sponges and fresh water shells. Mr. Etheridge, to whom I showed these shells, says they are all species of *Limnaea*. These old beach marks, and the shells they contain, show that the lake has at one time been much larger and less salt than at present; and before very long it will no doubt become a salt plain, like that which we had to traverse before reaching the Karakash valley.

He also found »evidence to show that a large stream, issuing from the lake, at one time flowed down the Tankse valley into the Shayok river».

He gives 15,000 feet as the highest level for grain crops and 20,000 as the snow-limit.

Marsimik-la was passed (18,800) and from Pamsal Dr. Cayley pushed on to explore a new route. Henderson regards the Goghra valley as the head of the Chang-chenmo, which is probably correct as only a small tributary can originate from Lanek-la.

The hot springs were estimated at 150° F. One of them was surrounded by a large stalagmite formed of carbonate of lime.

Between Goghra and Ni-chu they crossed a pass: »The ascent was very gradual and easy, except for two miles near the top.» Thus this pass can hardly be any other than Chang-lung-yogma. All the rocks in the valley consisted of slate, gneiss, and mica schist, »except near the hot springs, where some fossiliferous limestone was seen». The pass was found to be 19,600 feet high. It had been discovered by Dr. CAYLEY, and was to the east of that taken by SHAW and HAYWARD. The camp Ni-chu on the other side was 18,850 feet.

The Ni-chu stream was said to go eastwards to a lake. Where they left Ni-chu the rocks consisted partly of fossiliferous limestone. Otherwise the Lingzi-tang was a level waste of sand mixed with angular fragments of gneiss, slate, sandstone and limestone. »At this point of the journey», it was said in a short but rather good description of the expedition, »the landscapes were of unearthly dreariness and magnificence. Far to the west the jagged peaks of the great Karakoram range

¹ Op. cit., p. 60.

shot up into the sky; to the north the Kuen Luen mountains walled the horizon; while eastwards stretched a barren desert, bounded by hills the ridges of which were fantastically shaped into domes, towers, and minarets.»¹

The peaks of the Kara-korum shot up into the sky. And still one of the members of the expedition, ROBERT SHAW, denied the existence of the Kara-korum! After another 25 miles to the north they reached Lak Zung, and again found fossiliferous limestone with *Encrinites* and *Hippurites*. He has a diagram showing a section of one of the hills in the neighbourhood; at the bottom, Lower limestone, on which there is Red Sandstone and at the top, Upper limestone with talus.

Fifteen miles to Tarl Dat (Taldat). The view from here was »exceedingly grand. The Kuen Luen range, tipped with snow, and the valleys filled with glaciers, extended like a wall across the northern horizon 30 to 40 miles distant»; between them and the mountains was an open plain covered for miles by an ice-bed.

After some fifty miles more they reached the Kara-kash River, surrounded by rugged peaks of granite more than 20,000 feet high, slate and gneiss prevailed, but the higher peaks appeared to be composed of granite. Their height, where reaching the river, was at 15,600 feet. He remarks that the last part of its course above Khotan had not yet been explored.

The lower Kara-kash skirts the southern base of the Kwen-lun Range, the higher peaks of which rise to 24,000 feet. On the southern side of the valley there is another range, or series of ranges, of mountains less lofty and less regular than those on the north.

From Sanju-davan he gives the following geological profile: the pass is in granite, then undulating hills of gneiss and mica schist, much contorted, then a vertical bed of limestone containing *Rhodocrinus*, then »carboniferous» and finally hills of blown sand over horizontal strata of red and white sandstone. The carboniferous limestone seems, however, only to be conjectural. The Sanju-davan he regards as the top of the Kwen-lun.

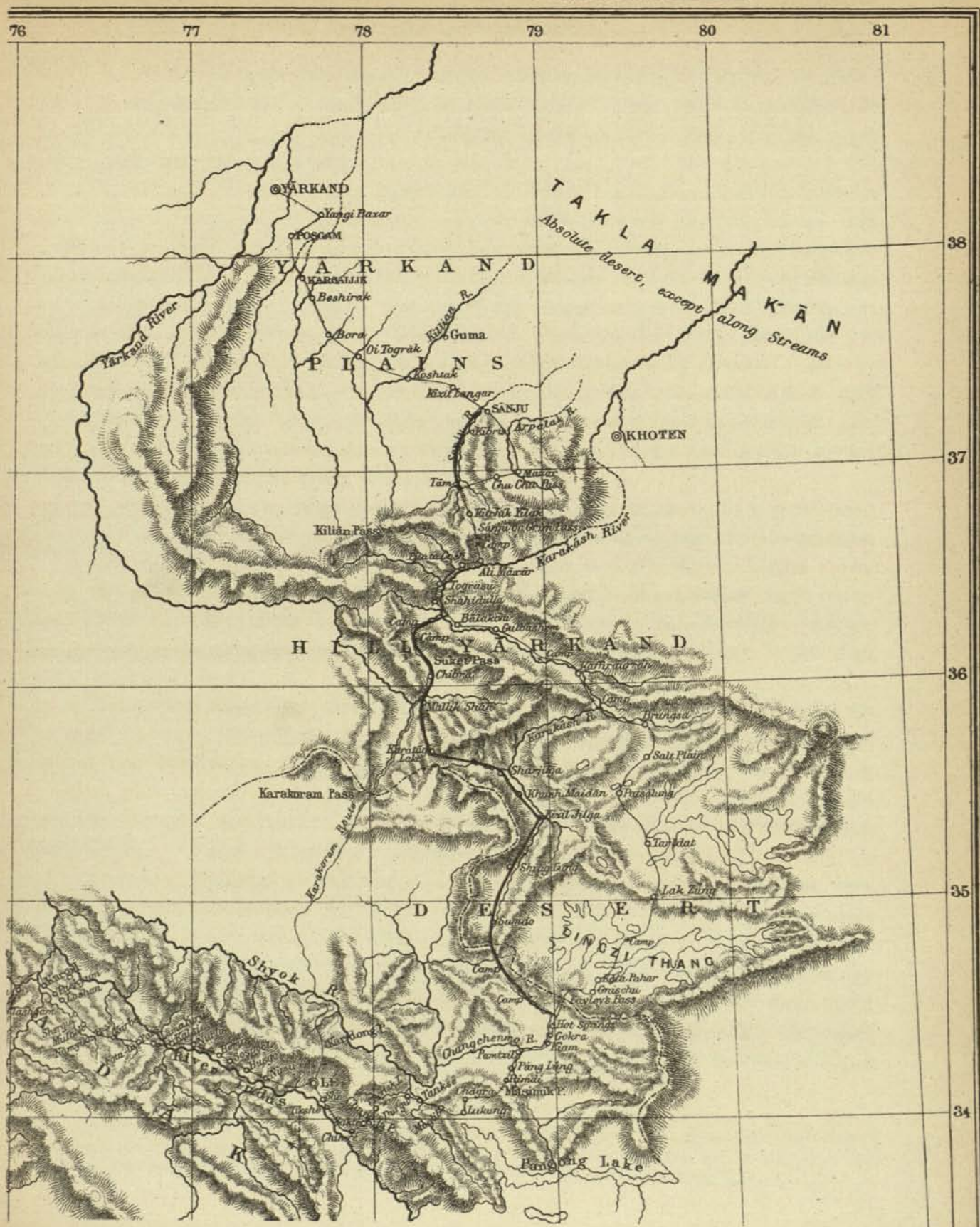
After their visit to Eastern Turkestan, they left Yarkand on September 5th. Having crossed the Suget-davan (16,000 feet) they »could see the Karakoram mountains twenty miles to the south, forming a wall of rugged snow capped peaks across the horizon».

They followed the Kara-kash »to its source», through a desolate weird-looking valley. At Kush-maidan the narrative suddenly comes to an end. A good general map, reproduced here as Pl. LX, accompanies the work, but the Kara-korum mountains are not distinctly shown.²

¹ *The Times*, August 31st, 1871; *Autobiography*, p. 65.

² *Map to illustrate the Route taken by the Yarkand Expedition in 1870, with a Section along the Route showing the absolute heights.*

Return Route —————



Map of Forsyth's first expedition, 1870.

GEN. STAB. LIT. ANST. STEIN

In 1873—74 FORSYTH carried out his great mission to Yakub Bek, on which he was accompanied by a whole staff of scientifically trained officers, everyone of whom has delivered a report on the important results gained. Most of them have also written independent books.

Already in a letter dated Shahidullah, October 18th, 1873, Forsyth gives a very good and short description of the three different roads between Ladak and Turkestan.¹ The eastern-most goes from Leh over the Chang-la (18,368), touches the Panggong-tso, crosses Marsimik-la (18,540), continues through the Chang-chenmo valley, enters, by a pass 18,800² feet high, the Lingzi-tang and Taldat plains, descends the Kara-kash River to Shahidullah, and is 26 marches long from Leh. It was first explored by the SCHLAGINTWEITS, then surveyed by JOHNSON and in 1868 examined by Dr. CAYLEY for trade purposes. After him came SHAW and HAYWARD. The latter discovered that the Kara-kash comes from Kara-korum, and not from the direction supposed by Johnson. Want of water and fodder makes this route impassable for mules and ponies.

The second route, which leaves the Chang-chenmo by a north-western pass, crosses a little part of Lingzi-tang, enters the Upper Kara-kash, joins the Kara-korum route at Ak-tagh; it was discovered by Hayward, and surveyed by Dr. Cayley. The pass leading out of the Chang-chenmo is somewhat steep: this is either the Chang-lung-yogma, which I took in 1906, or some other pass in its immediate vicinity. This route is two marches shorter than the first one and three marches longer than the Kara-korum route.

Regarding this latter, which Forsyth a few years earlier had hoped could be avoided on the eastern route, he now says it is the easiest between Leh and Yarkand. The difficulty is in the passes one has to cross in summer but avoids in winter. The summer route traverses the Kardong-la and Saser with its difficult glaciers. During 11 days one does not touch inhabited country, but on the eastern road during 20 days. Forsyth recommends the Kara-korum route.

He also speaks of the »Kurmadan» (Kumdan) glaciers, and the sublime view from »Gepshan» (Yapchan), but is not quite clear on this point. Of these glaciers Forsyth says: »From Brungtsa, Sasser, we marched ten miles to Kumda-hán, and camped in a hollow between two great glaciers, one of which extends away to the westward for some thirty miles, and looks like a great river of snow, flowing down from a lofty snowpeak through a narrow valley, flanked by high hills; the other corner straight down, about six miles, at right angles to the Shayok bed, which it

¹ *Proceedings Royal Geographical Society*, Vol. XVIII. 1873—74, p. 111.

² Or 5,731 m. I found the Chang-lung-yogma to be 5,780 m. The latter must be situated very near Forsyth's pass, as was also stated to me by an old man amongst my servants who had accompanied Forsyth. According to Trotter Forsyth, however, travelled by Chang-lung-yogma.

has almost blocked up, the only passage being through the stream, that has worked its way through the glacier, where it struck the opposite cliffs of the valley.»¹

Forsyth's second mission was on a much bigger scale than the first. He now travelled as an Envoy and Plenipotentiary of the Queen to the Court of Yakub Bek, the famous Atalik Ghazi. The purpose was to conclude a commercial treaty with this ruler of Alti-shahr or Eastern Turkestan. By Colonel YULE (Sir Henry) the envoy was supplied with all possible information regarding the unknown countries of Central Asia, and hints and suggestions as to the inquiries that were to be made. The expedition was not merely a diplomatic one, it consisted also of a staff of distinguished officers and naturalists, and geography could, therefore, expect a harvest of very valuable new information. Nearly all of these members later on became famous in the history of Asiatic exploration: Lieutenant-Colonel T. E. GORDON, Dr. BELLEW, Captain CHAPMAN, Captain TROTTER, Captain BIDDULPH, Dr. STOLICZKA, and several orientals.

BIDDULPH, TROTTER and STOLICZKA were sent in advance, July 15th, 1873, from Murree to Shahidullah. The head-quarters' party reached Leh September 20th, and left it on the 29th. They first crossed, in the Kardong-la, the Kardong Range, which »separates the valley of Ladak from that of the Shayok River. It is composed of gneiss and granite.»² Beyond Tirit the valley is an open river channel between bare hills of schist and granite and gneiss. The hot springs of Panamik had a temperature of 167° and 174° F. They crossed the Karaul-davan (14,550) and passed lofty granite mountains on the road to Brangtsa, over the Saser they wandered three miles over glacier ice (17,270). At the Shayok, on the other side of the pass, the caravan divided, the heavy luggage being sent with Mr. JOHNSON by the Murghu and Dapsang road.

The next stage took the envoy and his officers to Kumdan. They descended to the bed of the Shayok, followed it upwards and had, during two hours, eight or ten crossings of the river, after which they

came to a glacier lying right athwart the valley which runs in a north-west direction. We here entered a narrow lane between vertical walls of white marble rocks on one side and bottle green glacier on the other, and for one hour went up its stream, crossing from side to side in continual succession over narrow ledges in the ice, and through the water by breaks in it, alternately hugging the rock, and sliding against the smooth glacier, till finally we emerged upon the valley beyond; and then, going on for a mile or so, we camped on a raised beach of shingle under a sheer wall of white marble only a few hundred yards ahead.

The glacier ahead of us is seen winding down a long valley of which it fills the hollow just like a solid river, and at its top, many miles away to the west, rises a very

¹ *Autobiography*, p. 100.

² H. W. Bellew, *Kashmir and Kashgar, a narrative of the Journey of the Embassy to Kashgar in 1873-74*. London 1875, p. 144 *et seq.*

remarkable peak — the most prominent in all the landscape. The advance of this glacier obliquely across the valley, by closing its passage produced that inundation of the Indus in 1842 that proved so destructive along its course down to Attock.

The first glacier had violently pressed against the opposite side. The second glacier proved to be easier to cross. The road could not be used in summer on account of the sudden floods from the melting glaciers. Then they proceeded to Yapchan or Gyapthang as BELLEW says (15,150 feet), on the »wide bleak plateau, which forms the table-land of the Caracoram range». Three main lines of glaciers from N. W., west and S. W. were seen coming down forming one great mass filling the wide plain into which the river bed expands. All started from lofty snow peaks.¹ Bellew's description of the Kumdan glaciers was the best so far written, and hardly is excelled at the present day.

At Dowlet Bek-öldi, with ridges of loose shales and no snow, they were re-joined by Mr. Johnson.

Along the foot of the »Caracoram range» they continued up to the pass (18,300).² He says: »The Caracoram range is here the true watershed between the affluents of the Tarim on the north and the Indus on the south and on each side is supported by a table-land of swelling plateaux of very similar character as to elevation, soil, and blank desolation.»

Whilst the mission, from Camp Ak-tagh, followed one of the sources of the Yarkand-darya and left the narrow passage of Wahab-jilga behind them, Captain BIDDULPH went on to explore the sources of the Kara-kash River.

From the way over Suget-davan (17,500) to Shahidullah and »Camp Caracoram» the following rocks are mentioned: broken slate, black shale, moraine banks of granite boulders, schist, shale and gneiss. On the road to Sanju-davan (16,300) schist, silverygrey slate and mica.

The journey back was begun May 17th, 1874, and took them over Kok-yar and Yangi-davan (15,800). At Ak-tagh they joined their former route to the Karakorum Pass. From Dowlet Bek-öldi they left the Kumdan route, »now impracticable owing to its floods», and went by the Dapsang route (17,500) from where they came down into a deep and tortuous chasm which is overhung by high cliffs of red clay and conglomerate. This is the Kisil-unkur or »Red grotto», the way I passed in 1908. At Murgho (14,800) one of the ablest members of the expedition, FERDINAND STOLICZKA died, June 19th.

At the start of Forsyth's second mission it had been decided that it should proceed to Shahidullah in two parties, of which we have followed the route of the

¹ Op. cit., p. 161 *et seq.*

² Or 5,579 m., which seems to be the figure accepted on the last editions of French and German maps, *vis.* 5,580 m. I found 5,658 m. in 1902. STEIN has 5,697 m. in 1908.

headquarters over the Kara-korum Pass. A detached party, consisting of Captain TROTTER, Captain BIDDULPH and Dr. STOLICZKA, was directed to proceed *via* Chang-chenmo by the route by which the former mission returned from Yarkand in 1870. It was hoped that this party might be able to discover »some alternative route by which that line of road might be shortened and difficulties avoided».¹

TROTTER describes the three routes, of which the eastern one, over the Chang-tang, was of special interest. It was surveyed by the PUNDIT KISHEN SING, and TROTTER is right in regarding this survey as »one of the most important geographical results secured by the mission». Shaw had obtained information about this road from the natives, which agreed remarkably well with the Pundit's map.

A traveller from Leh to Khotan might follow the route by the Panggong-tso, along which the Pundit travelled, but he would more probably take a short cut from Lukong to the Mangtza-tso, following the ordinary Chang-chenmo route to Yarkand, to the point where the road leaves the Chang-chenmo valley. At the head of this valley he would find an easy pass, which we now know as Lanek-la. This road would be 40 miles shorter than the road by Noh. From Mangtza the road lies over a series of high plateaux varying from 16,000 to 17,000 feet in height, crossed here and there by low ridges which rise somewhat irregularly from the surface of the plain which contains numerous lakes, most of them brackish. In latitude 35° 7' North the Pundit crossed at a height of but little more than 17,000 feet, the watershed of a snowy range which may perhaps be the true eastern continuation of the Kuen Luen.²

The Keriya-darya begins from the northern side of the pass. After having crossed another range the road goes down to Polu.

There was grass and fuel the whole way, except one stage, and Trotter recommends it to merchants. That the road has never been in use, Trotter thinks is due to hostilities from the Taghliks and Changpas, who make the traffic uncertain. Therefore he proposes that the relations with China should first be settled, and then, he says:

Leaving the plains of India at the ancient city of Najibabad, the starting point of the old Royal Road stated by Moorcroft to have crossed these same mountain systems, a good road about 210 miles in length, and only crossing one low pass, leads to the Niti Pass (16,676) over the main Himalayan range. Descending from the Niti Pass, due north into the Satlej valley, and crossing that river at Totling (12,200), and crossing by the Bogo La (19,210) into the Indus valley at Gartokh (14,240) the road would then follow that river to Demchok. Thence it would go over the Jara Pass due north to Rudokh and Noh, and by the newly surveyed route to Polu and Khotan.³

Trotter thinks it possible that at some distant day this road may form a highway to Turkestan.

Speaking of the Forsyth Mission, Colonel WALKER gives the following report regarding the work of the Pundits on the road between Leh and Yarkand:

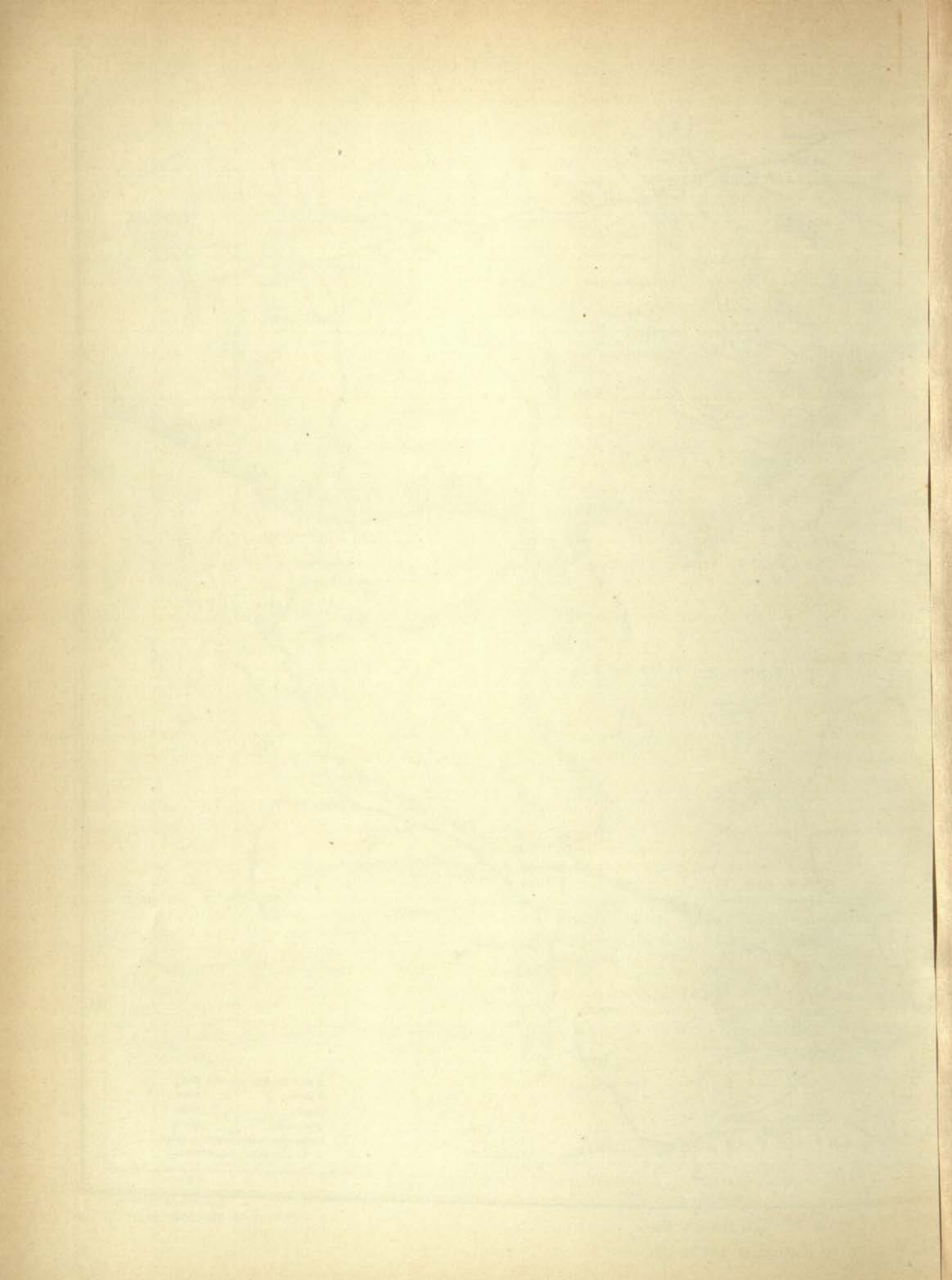
¹ *Account of the Survey Operations in connection with the Mission to Yarkand and Kashgar in 1873—74* by Captain HENRY TROTTER. Calcutta 1875, p. 4.

² *Ibidem*, p. 15.

³ *Op. cit.*, p. 16.



Map of Central Asia to accompany the Paper by Capt'n H. Trotter on the Geographical Results of Sir T. D. Forsyth's Mission to Kashghar 1873-74.



It was not considered desirable to send the (Hindú) Pandits into localities inhabited solely by a Mahomedan population, and hitherto they had been chiefly employed in surveying various lines of routes between Ladakh and Yárkand, some new, others old but requiring rectification. But while Captain Trotter was absent in Wakhán one of these men, Krishna, was sent viâ Sanju to Khotan, with instructions to penetrate as far eastwards as possible. He traversed the ancient road to China, as far as the Sorghák gold fields, and then, returning to Keria, struck southwards along the road to Rudok, crossed the Kuen Luen range and the great table-lands of the higher Himalayas on the western confines of Chinese Thibet, and reached the village of Noh, which is about 20 miles to the north of Rudok; here he was stopped by the Chinese officials and nearly turned back again by the road he came, but eventually he was permitted to go direct to Leh by the Pangong Lake. His work was very carefully executed, and has stood the tests, furnished by comparing the route survey with the astronomical and trigonometrical determinations of position most satisfactorily, and this is all the more important in the present instance, in that large corrections have been shown to be needed in the work of 1865—66, which has hitherto been accepted, though with some misgivings.¹

The range which, north of Leh, separates the drainage of the Indus and the Shayok, and which in winter is crossed by the Diger-la (17,930) and in summer by the Kardung-la (17,900), »is the well-known Kailas Range».² This is the one which in BURRARD'S orographical system is called the Ladak Range. TROTTER says: »After crossing the Kailás Range and entering the Shayok Valley, the traveller has now before him the great Muz-tagh or Kárákorum Range.» As we know now, and as is clearly shown by Burrard, one has first to cross what Burrard calls the Kailas Range, and which in his system runs over the Kailas peaks and then north of the Tsangpo, — before one comes to the Great Kara-korum. On TROTTER'S excellent map (P. LXI)³ accompanying his paper, there is one branch from the main

¹ *Gen. Rep. on the Operations of the Gr. Tr. Sur. of India during 1873—74*, by Colonel J. T. WALKER, Dehra Dun 1874, p. 34. — Two years later Colonel Walker reported on the famous journey of Nain Singh from Leh to Lhasa: . . . Nain Singh the Pandit *par excellence* of Major Montgomerie's Transhimalayan Explorations — »was one of the explorers who were attached to Sir Douglas Forsyth's Mission . . . he was sent on his return from Yarkand to Leh, on an exploration to Lhása . . . He left Leh in July 1874, and succeeded in crossing the Tibetan frontier, in the disguise of a Láma, or Buddhist priest. Passing about 15 miles to the north of Rudokh, he travelled nearly due east for a distance of more than 800 miles, over a new line of country, separated from the valley of the Tsangpo — or Great River of Tibet — by an almost continuous range of snow mountains, which trends eastwards from the Aláng Gángri peaks, in longitude 81°, up to the Ninjin Thangla peaks, south of the great Tengri Nur Lake, in longitude 90½°. His road lay, throughout, over an extensive table-land ranging in height from 13,900 to nearly 16,000 feet above sea-level, a region containing a few gold fields, and numerous lakes and streams and almost covered with rich pastures . . . The Pandit struck the Tengri Nur Lake at its northwest corner, and travelled along the northern coast of the lake, — a distance of nearly 50 miles — to the opposite corner, whence he turned southwards to Lhasa.» — *Gen. Rep. on the oper. of Gr. Trig. Surv. of India during the year 1874—75*. By Colonel J. T. Walker, Dehra Dun 1876, p. 20.

² *On the Geographical Results of the Mission to Kashgar under Sir T. Douglas Forsyth in 1873—74*. By Capt. H. Trotter. *Journal Royal Geographical Society*. Vol. XLVIII. 1878, p. 173 *et seq.*

³ *Map of Central Asia to accompany the Paper by Capt. H. Trotter on the Geographical Results of Sir T. D. Forsyth's Mission to Kashghar, 1873—74*. *Journ. Roy. Geogr. Soc.* Vol. XLVIII, 1878, p. 173.

Kara-korum separating the upper Shayok from the Nubra, and another separating Nubra from the lower Shayok. Both these ranges are parallel with each other.

Of the Lingzi-tang and Aksai-chin, Trotter correctly says that they are two different names for one thing. It should indeed be difficult to tell where the boundary between them goes. The Chang-lung-barma Pass (19,300) was crossed by Captain BIDDULPH on an easterly road. As to the Chang-lung-yogma Pass, which is about the same height but a little farther east, TROTTER says it is the one used by FORSYTH on his first mission to Yarkand. Trotter now expresses his belief that the old Kara-korum route will always be used for trade, and so far he has been right.¹

On the eastern road, from Noh to Polu, fairly straight north-east, KISHEN SING'S map has the following stations: Sumzi Ling (15,570), Kiang Pass, Lugrang (with river going south), Gang Chumik and Dong Lung (both on the same south going river), a pass of 16,600 feet, Chumik Lakmo (ridge), Mangtza-tso (16,600), Tashlik Kul, Dak Nak, Rikong Chumik, Yeshil Kul (16,160), a river said to be the head of Yurung Kash, two small lakes (16,880) supposed to be the head of Keriya-darya, Arash (16,020), Aksu, a pass of 17,290 feet, Ghubolik (16,960), Sulphur Lake, Ghubolik At Pass (17,500), Sibas, Khiakde, Gulok and Polu.

In his *Description of Routes between Ladakh and Turkestan*, TROTTER not only gives us excellent information about the different roads across the high mountains, but also deals with morphological questions of general interest.²

The three different roads he characterizes thus: 1. The Kárákorum route with variations (leading to Yárkand). 2. The Changchenmo route with variations (leading to Yárkand and Khotan). 3. The Rudokh (or Changthang) route (leading to Khotan). The first of these is subdivided into the Zamistání or winter and the Tabistání or summer road. Both join at the Kara-korum Pass. The streams form no obstacles in winter, but are often impassable torrents in summer. The merchants, therefore, often prefer the winter journey. The first obstacle is the Kailás Range, »which is said to run in one unbroken line from the source of the Indus to the junction of that river with the Shayok«. Here Trotter seems to make one continuous range of the two which some 30 years later were called Ladak and Kailas ranges by BURRARD. For Trotter says that this range, to the north of Leh divides the drainage of the Indus from that of the Shayok. It is crossed by the winter pass of Digar La, whilst the summer road crosses in the Kardong Pass. »After crossing the Kailás range and entering the Shayok valley, the traveller has now before him the great Muz-tagh or Kárákorum Range.« Here the frozen Shayok has to be crossed 36 times. In

¹ Loc. cit., p. 182.

² *Report of a Mission to Yarkund in 1873*. Calcutta 1875, p. 241 et seq.

summer the traveller ascends the Nubra valley, and the caravans from Yarkand often halt a week at Panamik. Just above the Changlung village a precipitous hill of 4,000 feet in 5 miles has to be ascended. Crossing the Karaol Pass the road descends into the Saser stream and then again ascends the snow and glacier pass Saser La in the Kara-korum Range between Nubra and Shayok. The road goes down from it to the Shayok which has to be crossed. At Murgho the road joins a stream from the Dipsang plains, and proceeds to the Kara-korum Pass. »The Kárákorum Pass, though 18,550 feet above the sea, is by no means so formidable an obstacle as is generally supposed. It is always free from glaciers, and in summer from snow. The ascent on both sides is gentle, and the road good, so that, although it forms the water-shed between Hindústán and Central Asia, it is less of an obstacle to the merchant, than the Digar, the Khardung, the Saser or the Sanju Passes.» On its north side the road follows a headwater of the Yarkand River to Ak-tagh where the roads again diverge. The winter road proceeds to Yangi-davan in Hayward's Western Kuen-lun, the summer road passes over a spur of the same range by the Suget-davan.

There is a great amount of valuable geographical material in Trotter's Narrative, Latitudes, Longitudes, Heights, Magnetic and Meteorological observations and Routes.¹ The road from Yarkand to Leh *viâ* Sanju and the Kara-korum Pass is described by Dr. BELLEW, who made it in October and November, 1873.² The same author gives us the itinerary Yarkand to Ladak *viâ* Kok-yar, accomplished in June 1874. Captain BIDDULPH gives the stations and characteristic features of his road from Leh to Shahidullah, passing the Chang-chenmo in September and October 1873,³ and Captain TROTTER, those of his road from Gogra to Shahidullah made in the same months. Finally Captain CHAPMAN has a chapter on commerce between India and Central Asia across the Kara-korum.⁴

Lieutenant Colonel T. E. GORDON, has given some more details about the Kumdan glaciers and especially some very good and instructive sketches of the different glaciers as they were in 1873.⁵ His own words must be quoted:

We passed the lower Kumdan glacier the first day. It comes from the high peaks to the north-west, and continues down the right bank of the stream for over two miles, forming a perfect wall of ice rising from the water about 120 feet, and showing a surface covered with countless pinnacles and points. Portions of it yet stand at several places on the opposite bank, where the original mass was forced against the great up-rising red cliffs, and blocked up the stream, thus forming a lake, which at last burst this ice barrier by the increasing pressure of its collected waters. We camped that night at Kumdan

¹ Op. cit., p. 295—460.

² Op. cit., p. 421.

³ Op. cit., p. 426.

⁴ Op. cit., p. 474.

⁵ *The Roof of the World, etc.* Edinburgh 1876, p. 17 *et seq.*

under a high cliff on the deep shingly bed of the old lake formed in the manner just described. — On the 10th we continued in the same general northerly direction, and passed the upper Kumdan glacier, which shoots down from a lateral valley to the north-west, and almost touches the opposite side of the main valley.

Gordon approached within two miles of the Remu glacier. The following day he had a very fine view of the north-western portion of the Remu glacier, »which showed right down in the main valley, with an even surface, wonderfully sea-like«. He regards this glacier as standing unrivalled in its grandeur of extent and close resemblance to a frozen sea. It rises amongst peaks and ridges from 19,000 to 24,000 feet high. It is about 21 miles in length. The Shayok cutting away successive blocks of ice, usually prevents farther extension. »The glacier, however, has been known on several occasions to protrude right across the valley of the Shayok, so as to dam up the stream and form up a large lake, ending in a cataclysm when the water finally bursts through the ice and rushes down the valley in a mighty and destructive flood wave, similarly as has been observed of the Kumdan glaciers lower down.«¹ Gordon, however, is able to inform his readers that the disastrous inundations of the Indus were not caused by the damming up of these glaciers, but by a huge landslide in a quite different region.

The map accompanying Gordon's work has the title, *Part of the preliminary map of Eastern Turkistan to illustrate the reports on Sir Douglas Forsyth's Mission to Kashgar, 1873—74. Compiled by Captain H. TROTTER.* Here we find a mighty range called Mustagh with the Karakorum Pass. The signification Kara-korum Range is not used.

W. T. BLANFORD, in his work on STOLICZKA'S geological results, distinguishes between the following ranges in N. W. Himalaya and Western Tibet.² The Kwen-lun Range on the edge of the Yarkand plain, the Mus-tagh Range with the Karakorum Pass, and forming the main ridge with the great watershed, the Ladak Range running along the northern bank of the Indus, and separating its valley from that of the Shayok, a nomenclature that is in accordance with that of BURRARD; the Zaskar Range, which forms the south-western limit of the Indus drainage, extending along the north-eastern boundary of Kashmir, and the continuation of which to the S. W. is sometimes known as the Baralatse Range, and the Himalaya Proper, the north-western continuation of which is the Pir Panjal. This view is only partly in accordance with Burrard's Zaskar Range.

A few extracts from STOLICZKA'S notes regarding the geology of the hill ranges between the Indus and Schahidullah may be of interest.³ The Indus near

¹ Op. cit., p. 20.

² *Scientific Results of the Second Yarkand Mission; based upon the collections and notes of the late Ferdinand Stoliczka, Ph. D.* Geology by W. T. Blanford, F. R. S. Calcutta 1878, p. 5.

³ Op. cit., p. 15 *et seq.* and *Records of the Geological Survey of India.* Vol. VII, p. 12 *et seq.*

Leh flows on the boundary between crystalline rocks on the north and eocene rocks on the south. Nearly the entire ridge north of the Indus consists of syenitic gneiss, an extremely variable rock as regards its mineralogical composition. Schistose and chloritic rocks form the greater part of the left side of the Chang-chenmo valley, and also occur south of the Saser Pass. Stoliczka looks upon this whole series as the representatives of the silurian formation. After crossing the Chang-chenmo valley to Gogra, he met with dark shales, alternating with sandstones. He occasionally observed traces of fucoids and other plants in these shales, but no animal fossils. On the Chang-chenmo route these shaly rocks form the ridge of the Chang-lung Pass, as well as the whole of the western portion of the Lingzi-tang, and they are met again after crossing the high plains and entering the Kara-kash valley. On the Kara-korum route BELLEW brought specimens of similar rocks from the Kara-korum Range itself. Judging from similar rocks which Stoliczka had seen in Spiti, and from their geological relation to certain limestones, he has but little doubt that this shaly series belongs to the carboniferous formations. In many localities along the right bank of the Chang-chenmo River, and at the hot springs north of Gogra, and on the southern side of the Chang-lung Pass, he found the carboniferous beds overlaid by triassic limestone. At Gogra and several other places, dolomitic beds occur. North of the Lingzi-thang, to the west of which the hills are mostly composed of the same triassic limestone, a red brecciated, calcareous conglomerate is seen at the foot of the Compass-la, but this conglomerate gradually passes into the ordinary grey limestone, which forms the ridge, and undoubtedly belongs to the same group of triassic rocks. Dr. Bellew found similar triassic limestones on the northern side of the Saser-la and on the Kara-korum Pass, overlying the carboniferous shales and sandstones. At Shinglung in the upper Kara-kash valley, Stoliczka saw the last traces of triassic limestone. Here the limestone rests upon some shales, and then follow immediately the same chloritic rocks which were noticed on the Lankar-la, alternating with quartzose schists, to both of which he attributes upper palaeozoic age. At Kizil-jilga regular submetamorphic slates appear, alternating with red conglomerate and red sandstones; and farther on dark slate is the only rock he saw on the whole way down the Kara-kash, until the river assumes a north-easterly course, some 14 miles east of the Kara-tagh Pass. From here to Ak-tagh the same slaty rock was met with the whole route. On Dr. Bellew's route the same slates prevailed. They further continue northwards across the Suget-davan and in single patches down the Suget River to its junction with the Kara-kash. A fine-grained syenite forms the whole of the Kwen-lun Range along the right bank of the Kara-kash River. The slates he refers to belong to the silurian group. They correspond to the metamorphic schists on the southern side of the Kara-korum Ranges.

Stoliczka arrives at the following conclusions:¹

Thus we have the whole system of mountain ranges between the Indus and the borders of Turkistan bounded on the north and south by syenitic rocks, including between them the silurian carboniferous, and triassic formations. This fact is rather remarkable, for, south of the Indus, we have nearly all the principal sedimentary formations represented, from the silurian up to the eocene, and most of the beds abound in fossils.

On page 42 *et seq.* are found STOLICZKA'S annotations from the more western return journey from Kok-yar to the Kara-korum Pass. In his *Concluding Summary* BLANFORD says:

Two sections across the Kuenlun were examined, one, on the Karakash river, the Suget and Sanju passes; the other, farther west by the Yangi Diwan. On the former route the greater portion of the range consists of syenitic gneiss, associated with various forms of schists.... On the more western route the same metamorphic rocks are found, but the syenitic gneiss is less developed, and there is a great quantity of greenstone.

To conclude this chapter I cannot find any better plan than to give a short *résumé* of Dr. PETERMANN'S splendid general description of the orography of Western Tibet so far as it was known after FORSYTH'S mission.² Petermann shows that the great features on HUMBOLDT'S and BERGHAUS' maps of the mountains in Central Asia were fairly correct, although the great Kara-korum was missing. The Kwen-lun and Himalaya form the northern and southern boundaries of the Tibetan highlands. Humboldt, and after him RITTER, regarded the Kwen-lun as the watershed between the Indus and the Tarim, and the Kara-korum Pass was part of the Kwen-lun. Between the Kwen-lun and the Himalaya the two great German geographers believed in the existence of an undulating, uninterrupted plateau. They did not suspect that tremendous ranges could exist between the two boundary ranges. Only the SCHLAGINTWEIT'S showed that a third system stretched between the two first known, although a transverse section across the whole lot hardly represented anything but a powerful protuberance of continuous mountains, sloping down to the plains in the north and south. Therefore, some geographers regarded the whole mass as one mountain system. Another theory, geologically proved by RICHTHOFEN from STOLICZKA'S materials, distinguishes between three independent mountain systems. In the following words PETERMANN expresses his view:³

Denn eine Dreitheilung ergiebt sich in der That als die naturgemässeste Betrachtungsweise unseres Gebietes; freilich nicht eigentlich in der ehemaligen Bedeutung dieses Ausdrucks, denn die Annahme dreier *Gebirgsketten* ist gänzlich fallen zu lassen. Zunächst erscheint es mit Rücksicht auf das Herrschen von zwei verschiedenen Streichrichtungen

¹ Op. cit., p. 17.

² *Ost-Turkestan und das Pamir-Plateau nach den Forschungen der Britischen Gesandtschaft unter Sir T. D. Forsyth 1873 und 1874, bearbeitet nach dem offiziellen Report of a mission to Yarkund in 1873, under command of Sir T. D. Forsyth, etc. Calcutta 1875. Petermanns Mittheilungen, Ergänzungsband XI. 1876—1877, p. 29 et seq.*

³ Op. cit., p. 31.

gerechtfertigt, *zwei Gebirgs-Systeme* zu unterscheiden, das des Kuen-Luen und das des Himálaja. Das mächtige Längenthal des oberen Indus giebt die Trennungslinie für eine weitere Theilung, die des Himálaja-Systems; das letztere lässt deutlich zwei Unterabtheilungen erkennen, von denen die eine durch das Gebirge von den Ebenen des Pandschab bis zur Nordgrenze der Nummuliten-Formation am oberen Indus repräsentiert wird, während die andere das gesammte Gebirgsland umfasst, das sich auf der anderen Seite jenes Längenthales aufbaut, vom Indus bis zum Kuen-Luen. Während die erstere als das eigentliche Himálaja-Gebiet zu bezeichnen ist, empfiehlt sich für die zweite Abtheilung die Benennung Karakorúm-Gebiet nach dem gleichnamigen Passe, der berühmtesten topographischen Lokalität dieses ganzen Landstriches. Das Karakorúm-Gebiet steigt vom Indus-Thale in schroffen, tief durchfurchten Gehängen schnell zu ausserordentlichen Höhen auf; im scharfen, charakteristischen Gegensatz zu diesem Südfall steht die Oberflächengestaltung des Nordabhangs, in schwachen Böschungen senken sich weitgedehnte Plateaux zum Südfusse des Kuen-Luen hinab, mit kaum merkbarer Neigung steigen die Wege von den Pässen in die grossen Steppen-Becken hinab.

The great difference between the northern and southern side of the Kara-korum is the result of precipitation and glaciation of the south-slopes. Add to this that the southern edge of the northern high plateaux coincides with the great watershed, so that the masses of detritus, which once existed on the southern side, were carried away by the Indus, whilst those on the northside chiefly remained untouched. But PETERMANN points out that the Kara-korum is not to be regarded as a *range*, as the SCHLAGINTWEITS sometimes had called it:

Können wir nun auch nach dem heutigen Stande unserer Kenntniss nicht mehr von einer eigentlichen grossen Karakorúm-Kette sprechen, so trägt doch der wasserscheidende Südrand des Karakorúm-Gebietes wenigstens theilweis, in seinem westlichen Abschnitt, den Charakter eines mächtigen Ketten-Gebirges. In der Südhälfte des westlichen Karakorúm-Gebietes können wir drei Haupttheile erkennen: das Ketten-Gebirge von Leh zwischen Indus und Schajok, das Mustagh-Gebirge im Norden und Westen des Schajok und das Bergland im Osten dieses Flusses. In den beiden letztgenannten Bergländern verläuft die grosse Karakorúm-Wasserscheide; während dieselbe aber im Mustagh durch die mächtige Hauptkette dieses Gebirges bezeichnet ist, wird sie von den Schajok-Quellen ostwärts oft fast unmerkbar, indem hier die Ketten auf dem hohen Tafellande, dem sie als Randgebirge aufgesetzt erscheinen, vorübergehend verschwinden, um später wieder hervorzutreten.

Petermann uses the name Mus-tagh for the system between the Shayok and the Hindu-kush and regards it as a system of parallel ranges, of which the northernmost and highest also is the water-parting. Regarding SHAW'S views PETERMANN says:¹

Da die Wasserscheide des Jarkand-Flusses und des Schajok nicht durch eine eigentliche Kette bezeichnet wird, vielmehr der wasserscheidende Südrand der Hochplateaux hier oft ohne merkbare Erhebung auftritt, so greift Shaw mit Recht den Namen Karakorúm-Kette in seiner ehemaligen Bedeutung an; mit vollem Grunde behauptet er, gestützt auf jene Verhältnisse, dass der Karakorúm als eine wasserscheidende *zusammenhängende Gebirgskette*

¹ *Ibidem*, p. 38.

in der früher angenommenen Erstreckung nicht existiere. Wir haben oben erläutert, inwiefern wir dagegen berechtigt sind, nach dem jetzigen Stande unserer Kenntniss von einem Karakorum-Gebiet zu sprechen.

Thus Petermann prefers the term Kara-korum *Region* to the term Kara-korum-*Range*.

Petermann has a generally very clear and correct conception of the extension of the plains situated between the Kara-korum and Kwen-lun. In the western parts, where the two systems approach very closely to each other, these plains are, of course, very narrow, and at the sharp bend of the Yarkand River they seem totally to disappear. The farther east, on the other hand, the broader and more extensive the plateau plains become.

Petermann's excellent map, Pl. LXII, is worthy of the text.¹ It gives an excellent idea of the mountain systems between Kashmir and Eastern Turkestan, a representation which was absolutely up to date in 1877 and could be improved only in detail by subsequent travellers. Only the Pamirs still left much to be desired. To the eastern edge of the map or to 82° East. long., the northern system is called Western Kwen-lun, which is a great improvement over HAYWARD'S proposal to make the transverse valley of the Kara-kash a boundary between Western and Eastern Kwen-lun.

The middle system is called Mustagh to 77° East. long. and its eastern continuation, Kara-korum Mountains. Curiously enough he places the name Himalaya north-east of the Indus and even the lower Shayok, a view which has been changed during later years.

It does not in the least diminish the geographical importance of FORSYTH'S Missions to Kashgar, that their chief object was of a political nature.² As such, however, they had as a consequence the Russian Mission in 1876—77, under command of Colonel A. N. KUROPATKIN, 26 years later Generalissimus in the war with Japan. He was not the first Russian to visit Kashgar. In 1859 Lieutenant VALIKHANOFF had been there in disguise. In 1868 Captain REINTAL had visited the town as an Ambassador, and in 1872 Baron KAULBARS had been sent in Embassy to Yakub Bek. A year before Kuropatkin's journey, Reintal had been on a second mission to Kashgar.

In May, 1876, General VON KAUFFMANN appointed an Embassy to Yakub Bek, with the object of opening negotiations with the »Bedaulet«, relating to the re-arrangement of the boundary line between his possessions and the Khanate of

¹ *Das Pamir Plateau und die angrenzenden Theile des Himálaya, Thian-Schan, Hindu-Kusch &c. Übersicht von D. Forsyth's Expedition nach Kaschgar 1874 und aller übrigen Reisen in demselben Gebiete*, von A. Petermann. Gotha, Justus Perthes 1877.

² This was at any rate the case with his second visit. Of the first the *Punjab Administration Report*, 1870—71, p. 10, says: »His visit was in no sense a mission and had no political objects.« The second expedition was always called a Mission in the narratives describing it.



Khokan which in February of the same year, had been conquered by SKOBELEFF. Kuropatkin says: »The importance of Kashgaria in our eyes was increased in consequence of the attempts of the English to draw this country to their side so as to incorporate it (1), in a neutral zone of countries which was to separate Russia from India, and (2) to acquire in Kashgaria a fresh market for the sale of their manufactured goods.»

The geographical results of this mission were no less valuable than those of the Forsyth Mission, and their importance highly increases if PRSHEVALSKIY'S journey to Lop-nor, and Altin-tagh, the same year, is added — and both, no doubt, stood in a certain relation to one another as appears from Kuropatkin's report.

As the English had surveyed Southern Pamir, the Russians surveyed the Northern. Kuropatkin continued eastwards from Kashgar to Aksu, Korla, Kara-kash and Bagrash-kul, and Captain SUNARGULOFF, a member of the expedition, proceeded *viâ* Uchturfan to Karakol.

The book Kuropatkin wrote on his journey contains one of the best monographs ever published on Eastern Turkestan.¹ His map, stretching from Osh to Bagrash-kul, and from Issik-kul to a little south of Yarkand, is also very well worked out.² It does not reach down to the regions particularly interesting us. As a matter of curiosity it should be noticed that he calls the mountains west of Kashgar, Bus-tagh and Mus-tau, both being our old Mustagh, or perhaps rather the Mus-tagh-ata.

¹ А. Н. Куропаткинъ: *Кашгарія. Историко-географическій очеркъ страны*. It is translated into English by W. E. GOWAN: *Kashgaria. Historical and geographical sketch of the country, its military strength, industries and trade*. Calcutta 1882. Regarding the eight appendices which have been left out in the English edition, in spite of their not being without »great political and military importance in view of any future operations in Kashgarian territory», they also contain the most interesting part of the work from a geographical point of view.

² *Карта сѣверной части Восточнаго Туркестана по свѣдѣніямъ капитана Куропаткина и маршрутной съемкѣ штабсъкапитана Статцева въ 1876 г.*

CHAPTER XXXII.

DREW AND OTHERS.

FREDERIC DREW undertook his important journeys before FORSYTH, but his work was published in 1875, and as he sometimes makes reference to the results of Forsyth's mission, it may be well to consider him after that mission.

In Drew's opinion the Eastern Kwen-lun Mountains form the northern boundary of the table-land of the Kwen-lun plains and Lingzi-tang, both separated from each other by a range of hills. The plains are 16,000 and 17,000 feet high, and the surrounding mountains 20,000 or 21,000 feet.¹ West of the high plateaux is »a great range of mountains«, which is called Mus-tagh and Kara-korum, the former name belonging to the western, the latter to the eastern portion of the system. The Mus-tagh—Kara-korum, however, consist of great mountain ridges.

Drew made some very important observations on climatic changes of the same kind as GODWIN-AUSTEN also had made, and which have been carried so far in our days. At Charasa in the Nubra valley he found the hard shale, graduating into a crystalline rock, to be rounded, smoothed, and even polished, like a *roche moutonnée*. At several places grooves and scratches were seen, denoting the movement over it of a glacier. Such marks were seen up to more than 100 feet above the alluvium. The whole valley must once have been filled by a gigantic glacier. At Panimik he saw 200 feet high hills ice-moulded and striated all over. He found marks of ice-moulding even up to 700 feet above the bottom of the valley, and he thinks it possible that such marks could be followed still higher up the hill sides.

On the 14,500 feet high ridge behind Charasa he found granite blocks which can only have been transported by glacier ice, and that glacier must have filled the valley to 4,000 or 4,500 feet. Such glaciers must have reached down to Shayok and perhaps a long way down in its valley.

Drew visited the western part of Panggong-tso, where he mentions GODWIN-AUSTEN, the Great Trigonometrical Survey, and H. STRACHEY as preceding authorities. He made several interesting observations on the lake, the water of which, as he

¹ *The Jummoo and Kashmir Territories. A geographical Account.* London 1875, p. 260 et seq.

correctly says, becomes fresher as one goes eastward. The saltiness denotes that the lake has no outlet. The supply of water comes mostly from glaciers. Some, he does not know how much, comes from the upper lakes through the channel at Ot. The information he got that the lake is frozen three months in winter is not correct, for only the upper, fresh, lakes freeze.

At $1\frac{1}{2}$, 3, and 7 feet he saw marks of higher levels of the lake. As to high beaches, his observations were confined to the southern side of the lake. At many places he found beaches at levels of from 40 to 50 feet above the present level of the water. Margin-marks occurred at various levels up to 100 or 120 feet.

He tries to trace the origin of the formations of Panggong-tso, mentions Trotter's maximum depth of 142 feet, and Godwin-Austen's finding the true cause of the lake to be the damming of its waters by side alluvial deposits.

Speaking of the N. W. corner he says: »Tracing on in this direction the highest margin-marks (those 100 or 120 feet) we find them to end against a fan, composed of gneiss, that comes out of a steep valley on the south-west, and abuts against the opposite (N. E.) hill boundary of our gorge . . . » This then is what dammed the waters at the highest level to which we have traced them; it is the fan described by Godwin-Austen, and the place is Surtokh. There are other, lower, fans which at earlier periods may have been forming dams in the same way.

From this material Drew makes his deduction regarding the history of the formation of the lake. First a tributary of the Shayok went through the valley *via* Tankse. Then the fans were formed which dammed up the valley, and the lake came gradually into existence. Then followed a dry climatic period, the lake returned eastward, diminished and became salt. Drew believes that at levels below 50 feet the surface of the lake remained unchanged for longer periods than above 50 feet. Every one of the upper lakes in the Panggong-tso has, in his opinion, also been formed by fans.¹

From our regions, south and north of the Kara-korum, Drew has some interesting observations.² For Rupshu he prefers the term »high-level valleys» to that of plateau. Only farther north he finds the terms plateau and table-land correct. »Between the country which drains into the Shayok and that whose streams flow into the Kara-kash or into other rivers of Eastern Turkistan, is an elevated mass of ground-plains surrounded and crossed by rocky ridges — whence water finds no outlet, but dries up on the plains themselves.» He estimates the area of the isolated drainage-basin at no less than 7000 square miles. But he adds that »our knowledge of this tract is but scant, and of a portion of it only conjectural».

¹ This problem has in later years been dealt with by E. HUNTINGTON. Cf. *Pangong: a glacial lake in the Tibetan plateau*. *Journal of Geology*. Vol. 14, No. 7, 1906, pp. 599—617.

² Op. cit., p. 331 *et seq.*

In 1869 Drew went across the plateaux to the eastern branch of the Kara-kash partly following JOHNSON'S, partly CAYLEY'S footsteps. He gives a good description of the »Southern Watershed«, which is situated north of Chang-chenmo. Here he crossed a pass 19,500 feet high. He is right in saying that the passes in this tract are not much below the general level of the ridge. The rock he found to be shale, with interstratifications of sandstone. From its northern side the small streams go to the salt lake farther east. Still farther north is Lingzi-tang, separated by the Lokzhung Mountains from the northern plains, which he calls the Kwen-lun Plains. The average height of Lingzi-tang he calculates at 17,200 feet, very well in accordance with HENDERSON'S 17,300. West of Lingzi-tang there are »bolder hills and even snowy peaks; in these there is a gap, to follow which would lead one down to the River Shayok«. But he does not say that this is in reality the Kara-korum Mountains.

He found that the Lingzi-tang forms an isolated drainage basin. The whole ground has been deposited in a lake, a fact which had already been proved by JOHNSON. Drew found no means of ascertaining the depth of the deposits, and could follow them to 20 feet only, in the deep parts of the basin. At the margin, along the foot of the Lokzhung Range, he saw how the light-coloured flat of hard clay ends with a marked boundary against ground sloping about 2° upwards.

North-west of Tsothang he found complete beaches, — parallel curved shingle-banks, partly cemented by carbonate of lime dissolved from the stones themselves, which are of limestone. Such beaches were seen up to 150 feet above the flat plain. There has thus been a lake, the shore of which went along the edge of the Lokzhung Mountains, and there are evidences of a still higher water-level. Some margin-marks were also seen along the southern edge of the basin.

In the Lokzhung Range which is crossed by the path from Tsotang to Thaldat, different ridges are of different rock. There is an older encrinuritic limestone, ferruginous sandstone, and above that a limestone containing *Hippurites*, unconformably on the older limestone; other portions of a light-coloured limestone or crystalline marble, make conspicuous white rocks.

His Kwen-lun Plains are situated between the Lokzhung and Kwen-lun Mountains 16,000 feet high. The upper plateau is in parts covered with fragments of a brown calcareous cake an inch or less in thickness.

He discerns between HAYWARD'S Kara-kash the real source, and the eastern Kara-kash. The latter river is bounded immediately on the north by the main Kwen-lun chain, on the south by a nearly parallel line of mountains of slate and shale; otherwise he makes the Kwen-lun chiefly granitic.

North of Thaldat he also found shingle-beaches up to 80 or 100 feet above the plain. And after a very careful and interesting analysis of the materials and

facts he asks: how was this large lake formed: where would have been the outlet and is there any sign of a dam? Drew supposes the plain once drained to the Eastern Kara-kash, and later on it was dammed. »It is possible that at different times the dam may have been at different spots.... If, as is possible, the lake existed during part of the glacial period, then a glacier itself, with its moraines — perhaps a glacier occupying the head of Eastern Karakash Valley — may have formed the dam.»

In his *résumé* Drew gives the boundaries of the two basins and adds that to the north JOHNSON had shown »how the ridges and the valleys lessen in height till the plains of Khotan are reached». To the west was HAYWARD'S Kara-kash and high ground extending to the Kara-korum Pass and Suget-davan. To the east the country had never been explored. Drew thinks there is a bounding ridge of mountains on the east as there is one on the west. At the north-western corner of the basin of the lake or lakes he thus has an opening for former drainage between the Kwen-lun and the western ridge. This opening is now closed by alluvial accumulations. It was formerly probably obstructed to a much greater height than now, perhaps by glaciers and moraines, as glaciers at that time »were more numerous and larger than now». He also thinks a dam existed at the south-western corner.

From the highest margin-marks he finally draws the conclusion that at one time the whole Lingzi-tang and Kwen-lun Plains formed *one* great lake 60 by 20 miles and stretching to the very foot of the Kwen-lun Mountains. The subsequent sinking of the water and drying up of the lake he attributes to a change of climate. At a certain period of the desiccation the lake must have been separated into two parts.

Drew also visited some of the great Kara-korum glaciers.¹ In the Skardu tract he found lacustrine and glacial remains as GODWIN-AUSTEN and THOMSON had done before. He went up the Basha and Braldu streams. From Arundo he made an excursion and covered 3½ marches on and alongside the glacier. At the irregular edge the ice seemed about 200 feet high, and higher up probably thicker. The lower end was 1½ mile broad and covered all over with débris. The débris continued for some miles up. Still higher up clear ice appears between hills of moraine. Drew reached a point 20 or 25 miles from the end. He estimates the whole glacier at 30 miles.

As far as Drew could make out there was no possible way to the head of the glacier and over the watershed. But he says:²

A way from Skardu to Yarkand used in former times to lead travellers for some distance up the Baltoro Glacier, and then across the range, here called Mustagh, by one of the northern tributary glaciers. From certain ice-changes that road becoming too

¹ Op. cit., p. 364 *et seq.*

² Op. cit., p. 370.

difficult, a new one was struck out up a more northerly glacier that leads to where Mustagh Pass is marked on the large map. This one I followed for some distance up the glacier, but not as far as the summit of the Pass, to which as yet no European has reached.

Formerly Hunza robbers made the passage dangerous on the farther side of the range. The pass is open for but a short time in summer; as soon as snow falls on it the crevasses are hidden and the journey becomes dangerous. Drew was in Braldu in 1863 and got information from natives. All the difficulties caused the road to be disused. From 1863 to Drew's second visit in Baltistan in 1870, there had been no communication with Yarkand.

Drew gives the conclusive explanation of the famous and terrible Indus floods at Chach in Hazara in 1841 and at Attok in 1858. CUNNINGHAM and HENDERSON had searched for the cause in the breaking of the icy barrier of the lake above the Kumdan glacier. DREW, however, proves that the barrier must have been situated below the junction with the Shayok. The answer which was found out by Major BECHER in 1858—59 corroborates the views of Drew, who visited the place himself. Drew found that an earthquake caused a heavy landslip near Hatur Pir late in the autumn of 1840. Thus a lake was formed. The lake went up the Gilgit valley and must have been 35 miles long, and the lake branch in the main Indus valley must have had the same length. It got filled in 6 or 7 months. Then the dam gave way and the whole lake drained off in a day. There have been lakes formed at Kumdan he says, but they have nothing to do with the catastrophe of Chach.

In Drew's work we find some interesting tables of different routes. His route Nr. 23 goes from Leh *via* Kara-korum to Yarkand, passing Burtse, Kisil-unkur and Dowlet Bek-öldi; this is the summer route; the winter route passes the same stations. Nr. 24 is taken from *The Panjab Trade Report* for 1862. As in both cases the eastern road is mentioned, the Kumdan route seems to have been closed. On his map the Chong Kumdan glacier reaches the river, and the Kichik Kumdan and Ak-tash glaciers proceed very near it.

Drew's beautiful general map is chiefly taken from the Great Trigonometrical Survey's maps of 1874.¹ Here the Mus-tagh or Kara-korum Mountains are marked as a very conspicuous system just as nowadays. The Lokzhung Mts. are drawn as a S. E. continuation of the Kara-korum Mountains, the uppermost Kara-kash River forming a transverse interruption. The Aksai-chin Lake is entered as on the preceding maps, and the draftsman has made use of the discoveries of the British travellers dealt with in the previous chapters. South of the Eastern Kuen-lun of HAYWARD, and east of Kara-kash there is a group of small salt lakes, obviously the

¹ *The Territories of the Maharaja of Jummoo and Kashmir with portions of the adjoining countries. Compiled chiefly from the Maps of the Great Trigonometrical Survey of India, 1874.* — Pl. LXIII is the N. E. part of this map.



The Territories of the Maharaja of Jummoo and Kashmir, Drew, 1874.

same I have mentioned from my journey.¹ The appellation Dipsang Plains appears at two places; the one south of the Kara-korum Pass is the same as the one which my informants called Dapsang. The expression Kuenlun Plains for the open plateau-land south of the Kwen-lun, is far better than the somewhat uncertain Aksai-chin and Lingzhithang Plains. The map accompanying Drew's narrative was, no doubt, the best existing in 1875, and it took many years until it was improved. He has also several general maps showing the distribution of Snow, Races, Languages, Faith and Political situation. He has also a very good panorama showing the K₂ (28,265 feet) rising above the mighty masses of the Kara-korum. Drew's book was an extremely valuable addition to Europe's knowledge of these regions and he should be mentioned amongst the most prominent and able scientific explorers in the western highlands.

* * *

In his article: *An itinerary from Aksu to Yarkand and Ladak*,² VENIUKOFF communicates an abstract of a document discovered by POTANIN in the Central Record Office of Western Siberia, numbered 1153, and entitled *On the Frontier Trade in 1824—28*. For our present purpose it is sufficient to mention only a few names. The itinerary in question, without any further explanations, goes from Aksu to Yarkand and thence to Ak-tagh, being the 17th stage from Yarkand; thence to Darbazy-Siryūt, farther to Baransa and the second Baransa »the road leads over the Kara-kuran. The ascent is 15 versts, the descent also 15 versts. The snow never disappears, and during winter ten days are required to cross it». Yapchan: the road leads over the Ala-tau. The air is very oppressive. Springs exist, but no fuel or grass. Khundan: on the same mountain; springs; no grass or wood. Sasyr: on the same mountain, on a rivulet, a little fuel and pasture.

As the author of this itinerary calls the Shayok a rivulet, it is not surprising that he does not even mention the Kumdan glaciers, although he must have passed in front of their snouts. If the itinerary refers to the years mentioned, 1824—28, we may be pretty sure that the road was open at that time.

I have already referred to SAUNDERS' and MARKHAM'S views regarding the relations between the Kara-korum and Transhimalaya.³

The Indus, Sutlej, and Sanpu form a continuous trough in the same axial direction, and divide the Northern Himālaya from the Kara-korum and Gang-dis-ri Mountains. The Kara-korum divides the Indus basin from the basin of Lake Lob, and the Gang-dis-ri separates the Indus, Sutlej, and Sanpu from the elevated plateau of Tibet, which is drained

¹ *Vide* Vol. IV, p. 35.

² *The Geographical Magazine*, Vol. III, 1876, p. 239; from the *Izvestia* of the Russian Geographical Society XII, 1876, p. 222.

³ A. R. Markham: *The Himālayan System*. *The Geographical Magazine*. Vol. IV, 1877, p. 114. 38. VII.

by inland lakes. This general view is clear and perspicuous, and is made more so by the excellent map which accompanies Mr. Saunders' memoir.

I have already discussed the excellent map of TR. SAUNDERS, 1877.¹ He shows the Kara-koram Mts as *one* mighty range running S. E. parallel to the Upper Indus, passing Aling Gangri and Thok Jalung to a point east of Kailas and N. E. of Manasarovar where it suddenly comes to an end. Though it comes quite near to the Gangri Mountains, the latter cannot be said to be a continuation of the Kara-korum. Still the map seems to show that Saunders had a presentiment of some relationship between the two ranges. His Kuen Lun Mountains he has quite correctly drawn out along the whole northern front of Tibet and far away toward China. Far in the west he has adopted JOHNSON'S meridional range joining the Kuen Lun and the Karakorum Mts. The hydrography of the Yurung-kash is, of course, as it was on the map of the last-mentioned explorer.

In a review² RICHTHOFEN expresses his views regarding SAUNDERS, MARKHAM and SHAW and their controversies quoted above. In this article he says that in the history of the knowledge of every mountain system, three different epochs may be discerned. As a rule the distribution of the rivers is known earlier than the morphology of the ground; therefore the water-partings are first believed to coincide with the ranges, the principal ranges as situated between the main rivers, and second and third class ranges between smaller rivers and tributaries.

The second epoch enters with the exploration of the plastic form of the ground. It becomes evident that the arrangement of the mountains only partly coincides with the water-partings, the ranges prove to be pierced by the rivers and the general laws of geological structure appear. The third epoch is characterised by the fact that the features of the morphological or physico-geographical building are explained and understood by the geological research of the region.

RITTER and HUMBOLDT could not know anything of the interior arrangement of the Himalaya. CUNNINGHAM was the first to prepare the ground for a more correct understanding, for he dismembered the north-western Himalaya in a number of parallel ranges, altogether disregarding the interruptions made by rivers. Richt-hofen shows that Cunningham's Pir-Panjal Range is in perfect accordance with modern (1878) views.

Saunders and Markham, he says, clearly discern three principal ranges. They separated the water-parting range as a member of smaller importance. The difference between the view of the two geographers was that Markham reckoned the »Northern Range» to the Himalaya, whereas Saunders regarded both the Kara-korum and the Gangri-Mountains as not belonging to the Himalaya.

¹ Vol. III, p. 177 *et seq.*, and Pl. XXI.

² *Verhandlungen der Gesellschaft für Erdkunde zu Berlin*. Band V. 1878, p. 72.

It is surprising that he says, in connection with Shaw's discoveries:¹ Eine Hauptkette, für welche der Name Muztagh-Kette (statt Dapsang-Kette oder Karakorum-Gebirge) beibehalten werden sollte, fügt sich durch den Parallelismus ihres Streichens mit wachsender Sicherheit als ein Glied dem Himalaya-System an.

As to Saunders' map, Richthofen says it would take him too far to enter upon a criticism and discussion of the hypothetical representation it gives to the orographical development all the way from Assam to Northern China; which proves that Richthofen could not accept Saunders' orography. In a subsequent chapter we shall see, however, that in certain points he agreed with Saunders.

¹ *Ibidem* p. 74.

CHAPTER XXXIII.

A MYSTERIOUS TRAVELLER.

We should not quite forget an extraordinary story about a journey which seemed to have crossed our ground between the Himalayas and Kwen-lun, and which gave rise to a lively polemic in 1866 and the following years. It was published and discussed by M. VENIUKOFF in the Journal of the Imperial Geographical Society of St. Petersburg in 1861, and translated into English in two articles: *The Pamir and the Sources of the Amu-Daria* and *The Belors and their Country*.¹ VENIUKOFF says that just at a time when Bolor and the Highland of the Pamir were unknown, the connecting-link had fortunately been discovered, and that two new sources of information which mutually corroborated and amplified each other, although they had nothing in common in regard to their compilation, had appeared.

He alluded to the *Travels through Upper Asia from Kashgar, Tashbalyk, Bolor, Badakhshan, Vokhan, Kokan, Turkestan to the Kirghiz Steppe, and back to Cashmere, through Samarcand and Yarkand*; and to the Chinese itinerary translated by KLAPROTH in 1821, leading from Kashgar to Yarkand, Northern India, Dairim, Yab-tuar, Badakhshan, Bolor, Vokhan, and Kokan, as far as Karatau Mountains. Veniukoff correctly supposed that the enumeration alone of such names would excite the curiosity of geographers, and he regarded the new sources as being of the highest importance. The author of the *Travels* was obviously a German, in the service of the East India Company, despatched in the end of the 18th or beginning of the 19th century to purchase horses for the British Army. The original account was a magnificent manuscript in German, accompanied by 40 sketch-maps. The name of the mysterious traveller was Georg Ludwig von — the surname had been erased. Regarding Klaproth's itinerary, Veniukoff finds it valuable so far as the physical details are extremely circumstantial, but the *Travels* he finds especially deserving of wide publicity. And then he proceeds to give extracts about the Bolor and the surrounding region. It would be a waste of time and space to give a short *résumé*

¹ *Journal Royal Geographical Society*. Vol. 36. 1866, p. 248 *et seq.* and p. 265 *et seq.*

of this wonderful geography. Be it sufficient to say that Veniukoff regards as the highest mountain in these tracts the one which is »forming the knot or connecting link of the Bolor System with the Kuen Lun, Hindu-kush, and even Himalayas».

Sir HENRY RAWLINSON at once answered to this and criticized Veniukoff's papers in a most annihilating way. He says:¹

English geographers had been much surprised to learn from Russian sources that a detailed description already existed of a great part of this region, and so authentic appeared the announcement that it became the duty of the Geographical Society to inquire into the nature of these new materials, with a view to placing the information which might be obtained from them at the disposal of the public.

Sir Henry found it extraordinary that a country at which the British had been nibbling from the frontiers for the last fifty years, should all the time have been, as it were, at their disposal throughout its whole extent. The conclusion to which he arrived was that the »Travels were nothing more than an elaborate hoax». No German employé had been in the service of the Government of India and no horses purchased from those quarters at the time stated.

The next document in the matter is found in the letters from the famous and learned M. DE KHANIKOFF »on the Subject of Sir H. Rawlinson's Criticisms of the MS. Travels» etc.² He maintains emphatically that the German Traveller had really undertaken his journey within the last 20 years of the 18th century. The defence of Khanikoff is very strong and very well done indeed, at any rate, much stronger than Sir Henry's criticism.

To this Lord STRANGFORD made a reply,³ not very convincing, but culminating in the sentence, that no substantial reason in favour of the traveller had been adduced; nor had any reason been taken up in M. Khanikoff's vindication of the earlier part of the *Travels* which seemed to be tenable for one moment.

In a new article: *Additional Remarks on the Bolor Highland*,⁴ Veniukoff defends Georg Ludwig von —, refers to Khanikoff and fights Rawlinson. He now tells us that the much debated journey had actually been performed in 1769 or 1770, but the account written after 1800. Therefore, many things might have become confused in the traveller's memory, many jottings made in his diary might have become illegible, and, therefore, not utilised. »In this way I reconcile some small discrepancies which exist between his statements and more recent discoveries.» There is a good deal of truth in his words: »The dispute would prove a barren one, as neither I nor Sir H. Rawlinson have been in the part of Asia which forms the subject of this paper. Sir Henry has great knowledge of Iran, Mesopotamia,

¹ *Proceedings Royal Geographical Society*. Vol. X. 1865—66, p. 134 *et seq.*

² *Ibidem* p. 301 *et seq.*

³ *Ibidem* p. 315.

⁴ *Proceedings Royal Geographical Society*. Vol. XIII. 1868—69, p. 342 *et seq.*

and Afghanistan, but he has never been north of the Kabul Daria, nor yet beyond the Indus.»

But this is no argument against Rawlinson's criticism and Veniukoff himself feels that he moves on uncertain ground, for he expresses finally as a desideratum: »Let us hope that these places will not long remain unknown, and that our subsequent knowledge of the geography of the Bolor will not be based on hypotheses and surmises, but on accurate data.» It was the accurate data which were completely missing when this famous areopague of learned geographers were discussing the experiences of an Asiatic Münchhausen.

In a paper: *On Trade Routes between Turkestan and India*, Sir HENRY RAWLINSON brought forward some more information in the dark matter.¹ He says that the geography of the Pamir Steppe had been confused and mystified beyond all conception by a very singular network of ingenious forgery or romance.

It certainly was the case that both English and Russian geographers had had to contend for many years past, with a fabulous system of geography in reference to these regions. There was a certain paper in the archives of the Russian Government which had been followed by all Russian geographers; and a certain voluminous document was also in the archives of the British Government, which many years ago had been submitted to the elder Mr. Arrowsmith, and served as the foundation of that part of his map of Central Asia, which had been considered as a standard authority. Both these documents were utter forgeries; the product of the ingenious imagination of a clever man — a man well acquainted with the subject, but who invented the Itineraries and actually extemporised a system of geography.

After the paper, Lord STRANGFORD gave some more detail on the examination of the documents and of the strange rôle KLAPROTH seems to have played in the matter.²

In a very learned article: *Papers connected with the Upper Oxus Regions*, and especially in part 3 of the same: *Notes regarding Bolor, and some other Names in the Apocryphal Geography of the Upper Oxus*,³ Sir HENRY YULE says:

In the middle of last century the Jesuit Fathers, D'Arocha and others, who followed in the wake of the Chinese conquest of Eastern Turkestan, brought back with them a number of latitudes and longitudes, which, till recently, formed the chief basis of the geography of that part of Asia. These were of very various value, and embraced not only cities of the Turkestan basin, such as Khotan, Kashgar, Yarkand, etc. but also a number of places either in the heart of the mountains or beyond them to the westward. Thus to the north-west we find (with positions assigned) Andijan, Marghilan, Namegan, Kokan, &c., and to the south-west Sarikol, Karchu, Wakhan, Shighnan, Roshan, Badakhshan, and lastly, Pooeul or Bolor.

Yule found that a systematic *bouleversement* had affected a large part of the Jesuits' survey. »True names were there, such as Wakhân, Badakhshân, Shignân,

¹ *Proceedings Royal Geographical Society*. Vol. XIII, Session 1868—69, p. 10 *et seq.*

² *Ibidem* p. 20.

³ *Journal Royal Geographical Society*. Vol. XLII. 1872, p. 438 and p. 473 *et seq.*

Roshán, but positions were assigned to them which, when protracted, were wrong not by individual errors, but by some great error affecting a whole tract; and this error appeared to be *that a sheet of the original map had been turned through an angle of 90°*, so that east became north, north became west, and so on.»

When KLAPROTH compiled his own map of Central Asia, and had the Chinese map before him, he did not use the parts of Pamir and Badakhshan, but left here a blank upon his published map. YULE shows the whole procedure on three small maps, where the part which has been deranged in azimuth is shaded. The false geography, placing Bolor north of Badakhshan, *etc.*, was adopted by KIEPERT (1864), by VENIUKOFF, and in the apocryphal *Travels* in the Russian Archives.

On account of this careful examination he hopes that Bolor is finally disposed of. »We not only know that there is no such place where it was located, but we can also now account for the error.«¹ He hopes to see it dismissed altogether, and concludes: »Should there anywhere survive a lingering inclination to accept the documents of the Russian War-office as founded on genuine narratives, because of their agreement with the geography of the Jesuit Fathers, let us observe that, as we now see the latter to have been founded on downright accidental error, it follows that the former, which corroborate that error, are downright forgeries.«²

Sir Henry Yule, at another place³ refers to the translations of the Messrs MICHELL, called *The Russians in Central Asia*, where an extract of Veniukoff's records of the apocryphal exploration was to be found.

Regarding these documents Yule says that

their fictitious character had been essentially established by Sir Henry Rawlinson, even before the lamented Lord Strangford's discovery that a parallel mass of papers, embodying much of the same peculiar geography and nomenclature, existed in the London Foreign Office, purporting to be the Report of a Russian expedition sent through Central Asia to the frontiers of India, in the beginning of this century. The papers having been purchased from the celebrated Julius Henry von Klaproth in 1824, there can be little doubt, it is to be feared, that the acute and brilliant linguist and geographer was himself the author of all three sets of papers; nor perhaps was there any contemporary capable of accomplishing a fraud of the kind so successfully.

In a note Yule says:

I am not aware if the officials of the Russian War Department have ever explained on what grounds M. Khanikoff was led to suppose that the date of the entry of these

¹ »Humboldt, with his great authority, has too definitely attached this name (Bolor) to an erroneous orographical system.« Yule's *Marco Polo*, Vol. I, p. 179, n.

² In his note on Bolor (*Marco Polo*, I) YULE returns to the apocryphal MS. of Georg Ludwig von —, preserved in the Military Archives at St. Petersburg. »That work represents a town of Bolor as existing to the north of Badakhshan, with Wakhán still further to the north. This geography we now know to be entirely erroneous, but it is in full accordance with the maps and tables of the Jesuit missionaries and their pupils, who accompanied the Chinese troops to Kashgar in 1758—59.«

³ The Essay in Wood's book, 1872, p. LI *et seq.*

documents into their office was 14th August, 1806. That date is really the date of the letter of the pretended traveller, which is attached to the series; *i. e.*, it is an organic part of the fiction.

Taking up the extracts or abstracts of this German or this Chinese traveller, we find nothing that fits in with this consistent and gradual growth of knowledge. Yule finds it »lamentable to think that so estimable and zealous a geographer as M. Veniukoff's papers indicate him to be, should have been led to waste so much labour and ingenuity as have been expended by him on utter fictions like these». His papers published in the *Journal of the Royal Geographical Society* are with scanty deduction utterly baseless and futile, shadows of smoke.

Colonel Yule is, of course, right in everything he states in the matter. But where are the absolute proofs that KLAPROTH and nobody else has made himself guilty of such a fraud? It does not appear very likely that the most learned and celebrated Asiatic linguist of his time should find it worth while to waste time upon such a childish and stupid occupation.

The whole problem regarding the apocryphic itineraries has been admirably set forth by Sir HENRY RAWLINSON in his article *Monograph on the Oxus*.¹

As the fictitious travels affect the geography of all Central Asia, Sir Henry Rawlinson finds it necessary to eliminate from future maps of the Oxus the gross inaccuracies introduced by Russian Geographers. In 1861 M. Veniukoff first drew attention to two documents from the archives of the General Staff at St. Petersburg, which, in his opinion, were of great importance. The »discovery» was first made known to the British public in Michell's book, *Russians in Central Asia*, 1865, p. 50. One of the MSS was the journal of an English expedition, which, in quest of horses, towards the close of the 18th century, had proceeded from Cashmere to the Kirgis Steppe. The other was Klaproth's translation of a Chinese itinerary from nearly the same regions as the first. M. Khanikoff furnished the English journal to Sir Roderick Murchison, and Rawlinson, perusing an abstract of it, called it »an elaborate hoax».

The reasons for his arriving at this conclusion Rawlinson published in the *Journal* Vol. X. Khanikoff's defence of the Russian MS. and Lord Strangford's rejoinder were printed in the *Proceedings*, Vol. X. In the meantime Rawlinson discovered in the archives of the Foreign Office a third paper, a MS. report of Klaproth, »which bore a most suspicious resemblance, both in form and in subject-matter, to the Russian document; purporting, in fact, to be the journal of a Russian expedition sent towards India». Rawlinson, therefore, suggested that the double mystification of the Russian and English governments would probably be found to proceed from the same individual. Veniukoff's original papers were printed in the *Journal* (Vol. XXXVI,

¹ *Journal R. Geogr. Soc.* Vol. XLII, 1872, p. 482 *et seq.*

pp. 248—279), and Lord Strangford got permission to examine the Foreign Office MS. He arrived at the same result as Rawlinson.

The Klaproth MS. claimed to be a confidential report of a Russian Surveying Expedition from Semipalatinsk to the Indian frontier, 1801—1802. Klaproth borrowed it in 1806. An English translation of it with two copies of sketch routes was sold by Klaproth to the British Government, for some 1000 guineas. The MS. was accompanied by a MS. map of Central Asia in 6 sheets in Klaproth's handwriting, 1822. In a memorandum Klaproth said: »For the western part of Thibet the Penjab and Hindustan, I had no other materials than those furnished by Mr. Arrowsmith's Maps.» This statement is, in Rawlinson's opinion, untrue, »as a comparison of the maps will show, and indicates, as I think, intentional deception».

Lord Strangford's results were published in the *Proceedings* Vol. XIII p. 20. Herewith Rawlinson regarded the Klaproth imposture as complete. Khanikoff, on the other hand, with full approbation of the President of the Paris Geographical Society, upheld the authenticity of the German travels. Strangford proved, according to Rawlinson, that the geography of the three memoirs was essentially wrong, further that the same errors, especially in regard to the country between Kashmir and Pamir, were common to all three papers, and not to be traced in any other independent authority; finally, as two of the documents spring from Klaproth, he is either the author also of the third, or concerned in its fabrication.

Rawlinson proves that »every name that is quoted by Veniukoff from the Chinese Itinerary occurs in the Klaproth MS. and probably if Veniukoff's extracts had been fuller, the identity of the two documents would have been more conspicuous».

Colonel GARDINER corroborated in no small degree the statements of Klaproth, which mystified Rawlinson at first. Names of lakes and places as well as the general description were the same in both cases. After a careful examination, however, Rawlinson found

that all Colonel Gardiner's geography of the Upper Oxus and the surrounding countries, however overlaid with imaginary names, or in some few cases improved and verified by actual observation, was as a rule dependent for its foundation on Arrowsmith's Map of 1834; and when at the same time I remembered that this map was itself laid down in regard to its eastern portion from the Foreign Office MS., the mystery was at once dispelled, and I became aware that what seemed to be an independent corroboration was in reality nothing more than a repetition of the original fiction.

In his map of 1834, Arrowsmith had been imposed upon by Klaproth; Rawlinson regrets that Arrowsmith, »whose general accuracy is proverbial, should have given currency to the mischievous fictions of Klaproth» and in the cases of Bolor River and Wakhán, led Humboldt astray.¹

¹ If ARROWSMITH, in 1834, had been imposed upon by KLAPROTH, and given currency to his mischievous fictions, it is of interest to hear what Klaproth thought of the elder ARROWSMITH, AARON, 39. VII.

RAWLINSON continues:

The fabrication of the Foreign Office MS. and of the Chinese Itinerary can be brought home to Klaproth, I think, positively and with almost mathematical precision, but the attribution to him of the German Baron's narrative does not rest quite on the same determinate evidence. On his handdrawn map in 6 sheets Klaproth has, however, sketched Kashmir under the same distorted features as Georg Ludwig von —. Therefore, Lord Strangford was of opinion «that this agreement in a false geography, not otherwise known to exist, proved one of two things, either that Klaproth must have copied his map from that of the German Baron, the asserted recent discovery of the latter document being thus shown to be untrue, or that he was himself the author of both the fabricated Journals.

But Rawlinson seems to have some doubt:

There does, however, seem to be an alternative explanation that both Klaproth and the inventor of the Baron's travels may have copied from a third spurious original, which is as yet undiscovered, and I am the rather inclined to attach some weight to this hypothesis that beyond the Indus, Klaproth's Map exhibits no similarity whatever to the Baron's Journal, either in nomenclature or in the general description of the country; and it certainly does seem extraordinary if Klaproth really invented the Baron's story and tracings that he should not have reproduced the fictions in constructing his own subsequent map.

If Rawlinson felt inclined to attach some weight to the hypothesis of the existence of a third spurious original, as yet undiscovered, it is surprising that he could be so positive in his charge against Klaproth. He quotes Lord STRANGFORD'S opinion that MACARTNEY'S map had served as a basis for Klaproth's forgeries, but he believes that also other sources had been consulted. He says:

The name of Bolor, indeed, which may be called the pivot of all this spurious geography of Central Asia, bears direct evidence to the historical sources from which it is derived, for this title, although in general use amongst writers from the 10th to the 17th century, has become obsolete in the country ever since, and was certainly quite unknown at the date of these pretended travels, whether applied to a river, or to a city, or to a range of mountains.¹ With regard to the remarkably correct description of Kaferistan,

who was an uncle of JOHN and died in 1823. The year before, or in 1822, Klaproth found his map, «détestable». He then goes on in the following, lovely way: Dans un article inséré dans le quarantième cahier du Journal Asiatique (page 249), j'ai dit que feu M. Arrowsmith avait été le plus ignare de tous ceux qui se sont occupés à fabriquer des cartes. Il paraît que ce jugement a paru trop sévère à quelques géographes du continent, dont toute la science consiste ordinairement, à copier et à réduire ce que l'atelier d'Arrowsmith leur fournissait. Ayant à coeur de prouver que je n'avais employé, pour désigner les travaux de ce graveur anglais, que des expressions convenables, je vais soumettre sa carte de l'Asie à quelques observations, et l'on se convaincra, je l'espère, que l'épithète d'ignare, que j'avais choisie pour le qualifier, était fort bien choisie. — Le patriotisme brutal de quelques journalistes anglais, qui paraissent ignorer que la science n'a pas de patrie exclusive, leur a fait envisager cette critique de leur fameux faiseur de cartes, comme une attaque dirigée contre l'honneur national de l'Angleterre. La tête d'un ignorant seule peut enfanter une idée aussi absurde. . . — J. Klaproth: *Observation sur la Carte de l'Asie, publiée en 1822, par M. Arrowsmith. Mémoires relatifs à l'Asie. Tome III. Paris MDCCCXXVIII, p. 284 et seq.*

¹ With regard to Bolor Sir HENRY YULE states the conclusion «that there is no real evidence for the existence of a state, town, or river called Bolor on the western side of Pamir». In his opinion «the name has now become so tainted, first by mistake and next by fiction, that it would be well

which is given in the German Baron's Memoir, and the citation of actual words from the Kafir language, I can only suppose that the author borrowed from Mollah Nejib's 'Memoir', published in the Appendix to Elphinstone's 'Cabul', Vol. II, p. 373; but in that case the Russian MSS. must be later by some years than the date of 1806 which it bears, as Elphinstone's first edition was published in 1814.

To change the date of 1806 into something after 1814, simply for getting it to suit the accusation, seems to be a bad and unjust argument. When, on the other hand, KHANIKOFF brought forward an argument in favour of the authenticity of the Baron's travels, showing that his map contained an accurate delineation of Iskender-kul, which was a recent discovery unknown even to LEHMANN in 1840, Rawlinson replied that Klaproth might have obtained his knowledge of the lake from BABER'S Memoires, »where it is accurately described, though the locality has not hitherto been recognized, owing to Erskine having read the name as Kán instead of Fán». This argument is also very weak, for all Baber says is: »Among the mountains of Kan there is a large lake, which may be about a kos in circumference, and is very beautiful.»¹ How from this description an »accurate delineation» could be produced is difficult to see.

Sir Henry Rawlinson seems to have taken the greatest interest in searching for evidence against the greatest orientalist of the first third of the century. A few years later he again returned to the question, and sacrificed in a book of his² a disproportional space to the MSS of Georg Ludwig von —. Here he writes:

Suspicion has probably fallen on Klaproth because he is known at different periods of his life to have been engaged in the preparation of reports on Central Asia of a secret and confidential nature. One of these reports, indeed, 'On the Geographical and Political Condition of the Countries intervening between Russia and India', is said to have been purchased by our Government at the time of the Afghan war for the enormous sum of one thousand guineas, and to be still reposing in the archives of our Foreign Office This manuscript has been since examined and found to exhibit certain proof of having been forged by Klaproth.

It should have been interesting »not only in the interests of science, but with a view to its possible bearing on the vexed question of the authorship of the anonymous Russo-German manuscript», to hear something about this »certain proof».

rigidly to exclude it from geography for the future.» (Yule's Essay in Captain Wood's *Journey to the Source of the River Oxus*, p. LV). SEVERTSOFF's opinion is this: »The name of 'Bolor' in the sense of an entire mountain system, which I have denominated the Southern Tsun-lin, should, in my opinion, properly be excluded from the geography of Asia, because it is really *not the name of a mountain system*, and in this sense is therefore an error. Bolor is the name of a river, and of a town situated upon it; and is besides, according to Central Asiatic usage, the term for the one mountain from which the Bolor issues. They perpetuate an error by giving this name to a mountain region which has for several ages borne another appellation, instead of one that is general, and at the same time most appropriate, viz., Tsun-lin.» — *Journ. Roy. Geogr. Society*. Vol. XL. 1870, p. 398.

¹ *Baber's Memoirs*, p. 85.

² *England and Russia in the East*. London, 1875, p. 231.

In the 'Proceedings' of the R. G. S. (Vol. X, No. 4 and 6; and Vol. XIII, No. 1) and in the Society's Journal, Vol. XLII, p. 484, will be found a summary of the evidence which has satisfied British geographers that the Central Asian travels of the early part of the century, adopted by the Russians as genuine documents, are in reality a pure invention, assignable to the perverse and perhaps interested ingenuity of Klaproth.... It deserves further to be noticed that notwithstanding the complete exposure of the Klaproth fraud in England, the Russian geographers appear to be still unconvinced, reference being often made to the German baron in the late M. Fedchenko's notes, as a genuine authority, and the oracles Veniukoff and Khanikoff remaining 'dumb'.

But if it be a fraud, where are the proofs that Klaproth is guilty? The MS. in question is dated 1806, and registered in the official archives in Russia. Klaproth was born in 1783. Veniukoff asserts that the Chinese MS. had been translated by Klaproth in 1821. But why should he be guilty of the fraud of 1806? There is no evidence.

However, RICHTHOFEN accepts the British criticism, saying of the regions in question:

Dies war bis vor Kurzem ein räthselhaftes Land, da die den chinesischen Quellen nach Klaproth's Autorität entlehnte kartographische Darstellung sich als nicht im Einklang mit den Ergebnissen der mit Recht berühmten Reise von Wood und den Berichten des vor wenigen Jahren ausgesandten Mirza erwies, während sie mit anderen in eine mystische Hülle gekleideten Reise-Beschreibungen und Itineraren übereinstimmte. Sir Henry Rawlinson begann das Truggewebe der letzteren zu entwirren; aber dem scharfsinnigen Forscher Henry Yule war es vorbehalten, den Schlüssel zur Lösung aller Zweifel zu finden, indem er das ebenso regellose als räthselhafte System der Quellflüsse des Oxus wie sie bisher nach Klaproth's Zeichnung auf den Karten eingetragen waren, durch die Drehung eines Theiles der Karte um 90 Grad in seine richtige Lage brachte.¹

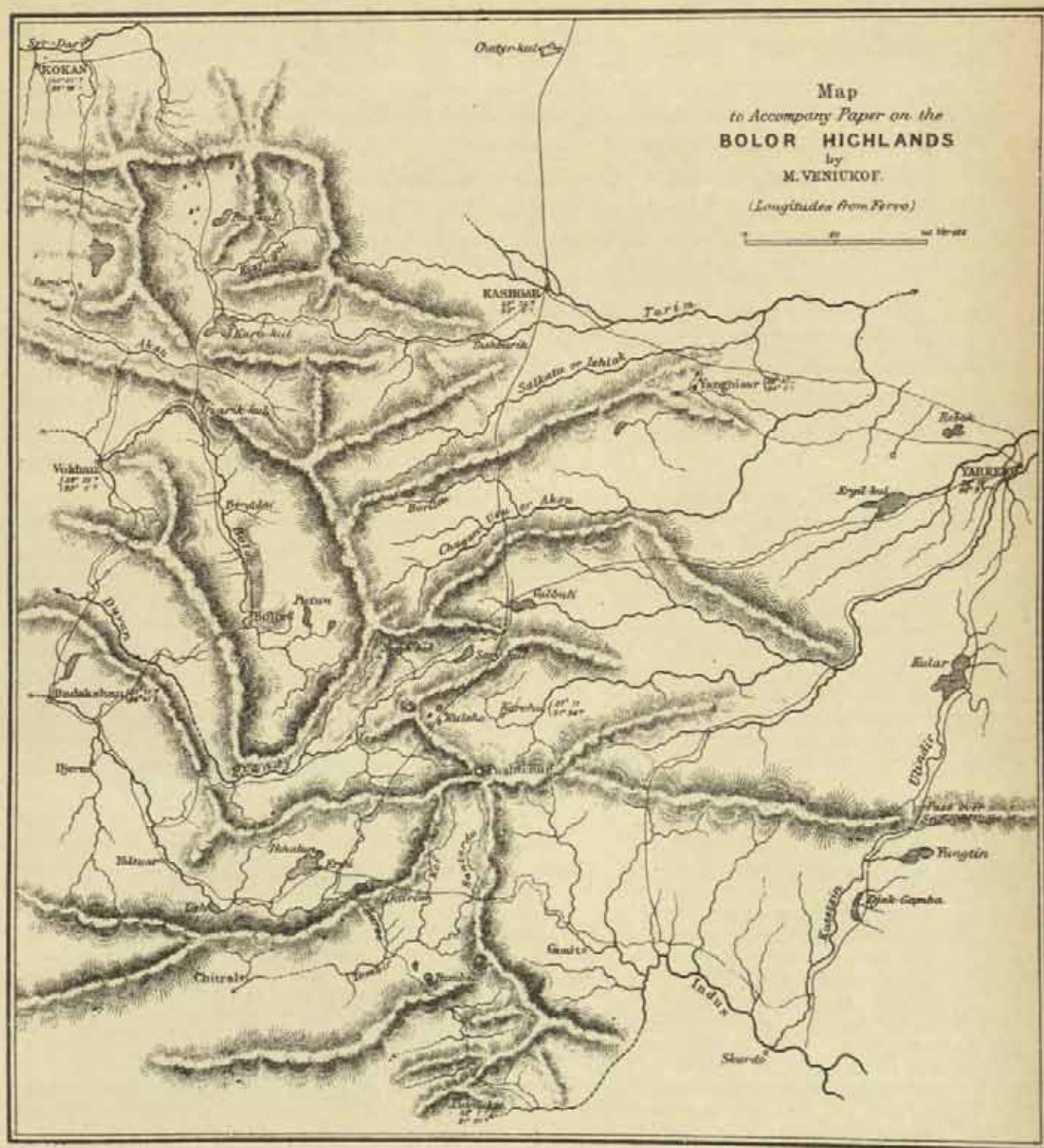
French scholars, on the other hand, had the greatest reverence for Klaproth. At his death he was praised for his conscientiousness, his love of truth, his perseverance, his aversion to theories not founded on facts, and his sincerity.

¹ *China*, I, p. 211. PETERMANN seems to have attached more confidence to KHANIKOFF than to the British critics:

«N. de Chanikoff macht darauf aufmerksam (Bull. d. la Soc. d. géo. d. Paris 1872), dass das räthselhafte Tagebuch des Georg Ludwig von — in Bezug auf die Pamir und die Gebirge und Plateaux nördlich von ihr ganz mit Fedschenko's Bericht übereinstimmt, was um so mehr ins Gewicht fälle, als der unbekannte Verfasser gerade über diese Gegenden weder aus Orientalischen noch aus Europäischen Dokumenten Information gewinnen konnte. Es ist jedoch wohl kaum mehr zweifelhaft, dass jenes Tagebuch nebst den Karten keine Original-Arbeit ist, sondern die spätesten Jesuiten-Reisen des 18. Jahrhunderts zur Grundlage hat.» *Pet. Mitt.*, 18. Band, 1872, p. 238. — Vide also CATHAY, Vol. IV, p. 182, note. — Speaking of the meridional Bolor E. DELMAR MORGAN says:

«The Russian geographers claimed to have discovered that there was no such meridional range and the English geographers set themselves to show how Humboldt's mistake had arisen, in the first place by falsification of documents by Klaproth, and secondly by the turning of a Chinese map through an angle of 90°, so that east became north, north became west, and so on.» *Scott. Geogr. Mag.* Vol. X, 1894, p. 337 *et seq.* — UJFALVY only touches upon this matter:

.... Klaproth qui avait déjà découvert tout un archipel, sans quitter son cabinet de travail, imagina la prodigieuse mystification du voyage d'un baron allemand en Asie centrale, mystification que Grigorieff n'eut pas de peine à percer à jour.... *Les Aryens au Nord et au sud de l'Hindou-kouch.* Paris, 1896, p. 20.



Veniukoff's map 1867.

It, therefore, seems unlikely and monstrous that he should have committed a fraud.¹

We should not leave this matter without saying a word of the map of the apocryphal geography.

VENIUKOFF'S original article was illustrated by a map, Pl. LXIV: *The Bolor Mountains and upper sources of the Amu Daria*. In the *Proceedings* 1868—69 a reprint of the same map was published on a reduced scale. There is a mighty meridional range: »System of the Bolor Mountains», forming a water-parting between the Amu-darya and the Tarim, and there is a place Bolor and a river Bolor. But the most curious is the southern part of the map. From Pusht-i-kuh the Hindu-kush stretches S. W. and the Kwen-lun straight east. Neither between the Indus at Skardo and the Kwen-lun nor anywhere else on the map is there the slightest indication of the Kara-korum. From the neighbourhood of Skardo a road goes along a tributary of the Indus, called Kutetsin up to a »Pass over Snowy Mountains», and thence directly down to Yarkand, without touching any more mountains at all. It

¹ In his obituary of Klaproth LARENAUDIÈRE says: La mort a frappé M. Klaproth, l'un des premiers sinologues des temps modernes, et l'un des hommes les plus profondément versés dans les langues, la géographie et l'histoire des peuples de l'Asie. Son nom était un de ces noms que l'Europe, éclairée entoure de son respect. . . . Sa perte a été vivement sentie par tout ce qui s'intéresse aux progrès des connaissances humaines, par tous les vrais amis des recherches consciencieuses. Ceux qui marchaient ses rivaux dans les routes difficiles de l'érudition, en France et dans la studieuse Allemagne, diront la part qui lui revient dans les progrès de la linguistique et de l'ethnographie. Nous, que des relations d'amitié ont tant de fois mis à même d'apprécier l'extrême variété de ses connaissances géographiques et physiques, son amour de la vérité, sa persévérance dans les travaux les plus arides, . . . nous nous empressons . . . de rappeler ici les traits principaux d'une vie si courte et si pleine. — After his taking leave from his service in Russia (»en l'obtenant il perdit les titres de noblesse qui lui avaient été conférés et quelques titres académiques; mais ceux qu'il s'était créés par son talent, par ses travaux, n'étaient pas à la merci des hommes, ceux-là lui restaient»), and after his visit to Napoleon on the isle of Elba, he settled down in Paris, where he remained from 1816 to his death.

At his death Klaproth was about to prepare a critical edition of the travels of MARCO POLO. It was intended to become a great publication, the expenses of which should be carried by the Geographical Society of Paris. Ce travail occupait depuis longtemps son laborieux auteur; nous ignorons dans quel état il se trouve, ce que nous savons c'est que lui seul pouvait le terminer; une bonne partie des matériaux n'existait que dans son admirable mémoire.

Tous les ouvrages de M. Klaproth sont empreints d'un grand amour de la vérité, d'une antipathie invincible pour les théories qui ne s'appuient pas sur des faits, pour le charlatanisme quel que soit son masque, pour l'ignorance vaniteuse. C'étaient là des ennemis qu'il poursuivait à outrance; mais il faut avouer, pour être juste, qu'il croyait les voir quelquefois ou ils n'étaient pas; erreur et disposition d'esprit d'autant plus fâcheuses qu'elles avaient pour principe un de ces dévouemens absolus aux intérêts de la science, une de ces convictions rigides, impitoyables comme la foi, comme l'œuvre religieuse dans le cœur du vrai croyant. . . . Pour être fidèle aussi à la vérité, n'oublions pas que nul plus que M. Klaproth n'était bienveillant pour ceux qui réclamaient ses conseils, seul ne rendait à ses rivaux, justice avec plus d'empressement, hommage avec plus de sincérité. *Notice Biographique sur M. Klaproth. Nouv. Annales des voyages*. Tome IV. 1835, Paris 1835, p. 5.

Some time ago I wrote to Dr. A. Herrmann asking his opinion, and got the following answer: Georg Ludwig von — ist, soweit ich sehe, eine Dichtung Klaproth's; jedoch keinesfalls eine Fälschung, denn er hat ja doch öffentlich niemals davon Gebrauch gemacht. Seine grossen Verdienste werden durch diesen Roman in keiner Weise herabgesetzt. — 20. April 1920.

would be useless to try to explain or excuse this miserable map. But it should be remembered that it was published in 1861, several years after THOMSON'S journey to the Kara-korum Pass, — if the map-maker did not believe in MIR IZZET ULLAH'S Journey across all three mountain systems. And a few years before had been published the narrative of the SCHLAGINTWEITS who had crossed the Kara-korum and Kwen-lun and reached Eastern Turkestan. All this seems to have been completely unknown to M. Veniukoff, who had greater confidence in the mysterious traveller and his curious geography.

Comparing this little map with the one reproduced in *Petermanns Mittheilungen*, 1861¹, Tab. 10, we find resemblance in great outlines, but considerable discrepancies in detail.

¹ *Das Bolor-Gebirge und die Quellen des Amu-daria*. Original-Zeichnung von Mich. de Venukoff. . .

CHAPTER XXXIV.

DIFFERENT VIEWS REGARDING KARA-KORUM IN THE YEARS 1871—1880.

In this chapter I have brought together some different views regarding our mountain system as expressed chiefly by British geographers in the decade from 1871 to 1880. As several of them are mere theories and hypotheses not always founded on the result of modern exploration, they are of no high value, but still they are of great interest as attempts to approach the truth, and a short reference to them should not be missing in an historical account.

As usual T. G. MONTGOMERIE is the leading name of the period. He is the most penetrating and perspicacious of all, and nobody has in the same high degree as he the gift of combination. In his brilliant article: *Report of The Mirza's Exploration from Caubul to Kashgar*, he speaks of the Kara-korum at a few places.¹

Already at the beginning of his article Montgomerie expresses the opinion that the Hindu-kush, Mustagh and Kara-korum may be considered as a continuation of the great Himalayan System, a conception that is only partly correct, as the Mustagh—Kara-korum constitutes a quite independent mountain system.

The MIRZA'S route afforded Montgomerie a means to determine the great watershed »which separates Eastern Turkistan from the basins of the Indus and the Oxus, viz., the Pamir-kul Lake, which comes between the Mustagh Pass and the Sirikul Lake of Wood». The Mustagh Pass was the most westerly point actually on the watershed determined by Montgomerie's survey operations. The new determination confirmed the opinion that he had held for many years, that the watershed continued to run N. W. from the Mustagh. To this conclusion he had come from the positions of many gigantic peaks fixed by the survey to the N. W. of the Mustagh. He did not believe that these peaks were situated on the watershed itself, but felt convinced that they indicated its general direction, as is indeed the case.

¹ *Journal Roy. Geo. Soc.* Vol. 41. 1871, p. 132 *et seq.*

Regarding the geographical position of different places in Eastern Turkestan, Montgomerie thoroughly discusses the results of HAYWARD, SHAW and others, and points out that already some ten years earlier, his survey of the Kara-korum and Mustagh Ranges had allowed him to conclude that the positions assigned to such places by HUMBOLDT in his *Asie Centrale* were not in accordance with British results.

It is curious to see how little even the best trained geographer knew of the Yarkand River only 50 years ago. The Mirza noted the size of the rivers between Kashgar and Kara-korum of which the Yarkand River was the largest. «It is a puzzle to think what can become of its great body of water.» As Yarkand was only at about 4,000 feet above the sea, Montgomerie thought that »it must very soon get pretty close to the level of the sea, and there is evidently no chance of its getting out of Asia into the sea«. He found it not impossible that the »Sirikul River« could come from the Karakul Lake. It is joined by other rivers, amongst them »by the river which drains the northern face of the Karakorum mountains; the combined stream forming the great Yarkund River«.

In 1872 Sir HENRY YULE communicated to the Royal Geographical Society a *Journey from Peshawar to Kashgar and Yarkand in Eastern Turkestan, or Little Bokhára, through Afghánistán, Balkh, Badakhshán, Wakhán, Pamir, and Sarkol, undertaken by Faiz Buksh, in connection with the Mission of T. D. Forsyth, during 1870.*¹ In this enumeration of itineraries of Oriental source, it is said that, on the whole, it appears certain that the Turkestan territory is surrounded on three sides by the Bulut Tagh chain of mountains. The following *résumé* of the general orography is not bad, provided that it is from an Oriental author:

The Pamir Steppes connect several chains of mountains, *viz.* the Hindú Kush, in the south-west; the Kuen Luen, in the east, the Kara Koram, in the Bolar; the Thián Shán chain, in the north, which runs from Tirak Dawan, and Ming Yol, to the Western Farghána Pass. According to native geographers, the Thian Shan chain, which commences north of Eastern Turkistán, belongs to Mongolistán, which, commencing north of Káshghar, runs westward of that place, and, running on southwards, joins the Kara Koram and Kuen Luen chain in the south-east of Pamir. Here it branches off in two directions; one branch goes into the Chinese Empire, passing to the north and north-west of Tibet (this may perhaps be Kuen Luen). The other great branch runs on to the ocean, passing north and north-west of the Punjáb and Hindustán, and south and south-west of Tibet. This is probably the great Himalaya chain of mountains.

In volume VIII I am going to deal with Sir HENRY YULE'S opinion regarding the Ts'ung-ling, as set forth in his *Essay on the Geography of the valley of the Oxus.*² Here, therefore, only a few words have to be said regarding the *Map of*

¹ *Papers connected with the Upper Oxus Regions. Journal Roy. Geogr. Soc. Vol. 42. 1872, p. 438 et seq.*

² John Wood: *A Journey to the Source of the River Oxus...* New Edition, London 1872.

the Country of the Upper Oxus, accompanying the *Essay*. To the S. W. we find the Kizil-art Mountains, south of which is the country Sarikol, and still farther south, Raskam. South of Yarkand there is instead of the Kwen-lun a range called Yangi-daban Range. The »Karakorum Range« forms only one very mighty range, being a watershed between the Indus and the Tarim, and crossed by two passes, the Shingshal P. and the Mustagh P. Immediately north of the Kara-korum is Pamir Tághdumbásh. In the text he mentions the journeys of SHAW, HAYWARD, JOHNSON and FORSYTH, but does not enter into the Kara-korum question.

VIVIEN DE SAINT-MARTIN, in 1873, is aware of the fact that not Mongolia but Tibet is the great protuberance of the continent.¹ At another place the same author communicates an itinerary from Mongolia to Tibet. The document containing its details had arrived through Russia.

To spare the caravans unnecessary hardships an itinerary had been fixed, almost obligatory, which had to be followed by all expeditions to Lhasa. From Urga the road went to Ala-Shan — 30 days, the distance being 1,200 versts. From Ala-shan to Koko-nor — 18 days, or 650 versts. From Koko-nor to Lhasa — 46 days and 1,400 versts, or 3,250 versts in all. In reality it is only about 2,600 versts. In such regions where the water is scarce the caravan separates into two parties. No mountains are met with until after having left Ala-shan.

Du treizième au trentième relais, sur le parcours de la route entre le Khoukhou-nor et H'lassa, le pays est complètement inhabité; les localités habitées ne reparaissent qu'à partir de la chaîne de montagnes dite Ouchighè, qui fait déjà partie du Tibet La vingtième halte se trouve dans un endroit nommé Tsagan-tologoï. Cet endroit est bien connu des Mongols La trente-quatrième halte se fait près du lac Tsoulmara. C'est la frontière du Tibet Le premier village se nomme Nantchjou (Nak-chu), il est le siège des autorités civiles et ecclésiastiques. C'est à Nantchjou que l'expédition abandonne ses chameaux, et en général tout ce dont elle n'a plus besoin pour traverser un pays à population stable. Depuis cet endroit elle voyage en charette avec des chevaux de relais en transportant seulement des tentes et des huttes pour les haltes de nuit.²

This was in accordance with HUC, excepting the carts. Huc says of the road from Nak-chu: les difficultés d'un chemin horriblement cailloux, ne permettent pas aux chameaux d'aller plus loin.³

¹ Nous savons aujourd'hui que la partie la plus élevée du grand massif central (3 à 4000 mètres) n'est pas la Mongolie, mais le Tibet; et cette énorme intumescence du continent, dont l'Himalaya, avec ses pics gigantesques, forme l'escarpement méridional, est un trait physique d'autant plus frappant, que d'un côté (au sud), il confine immédiatement aux plaines basses que traverse le Gange, en même temps qu'à l'ouest il descend en pentes moins brusques, mais aussi très-rapides, vers le bassin enfoncé du lac d'Aral, qui va se terminer à la mer Caspienne. — *Histoire de la Géographie et des découvertes géographiques*. Paris 1873, p. 537.

² *Un document indigène. Itinéraire du nord de la Mongolie au Tibet. L'année géographique, revue annuelle* par M. Vivien de Saint-Martin. Douzième année (1873). Paris 1874, p. 134.

³ Huc, *op. supr. ci.* T. II, p. 239.

In an article *On the Tribes of Northern Tibet*, first printed in the *Journal of the Bengal Asiatic Society*, Vol. XXII, 1853, p. 121, B. H. HODGSON uses the great orographical features of Tibet as ethnological frontiers. He says: »Hórsók is a compound Tibetan word, by which the people of Tibet designate the nomades who occupy the whole northern part of their country, or that lying beyond the Nyénchhín-thánglá range of mountains, and between it and the Kwanleun or Kuenlún chain.» Without entering upon the ethnological side of the question, I will only quote the following note by Hodgson, already alluded to in my Vol. III, p. 102. Regarding the Nyénchhén-thánglá he says: »This important feature of the geography of Tibet is indicated by the Nian-tsin-tangla of *Ritter's Hoch Asien* and by the Tanla of Huc. I have, following native authority, used in a wide sense a name which those writers use in a contracted sense; and reasonably, because the extension, continuity, and height of the chain are indubitable. Nevertheless, Ritter and Guyon have no warrant for cutting off from Tibet the country beyond it up to the Kuenlún, nor are Katché and Khór, the names they give to the country beyond, admissible or recognized geographic terms. Khór, equal Kór, is purely ethnic, and Katché is a corruption of Kháchhén or Mahomedan, literally Big-mouth.»¹

What Hodgson says about the names Khor and Katchi is quite correct, and it is easy to understand that he could not treat the country between the Nien-chen-tang-la and the Kwen-lun as anything but an uninterrupted plateau-land. For he had no reason to suspect that the northern Kara-korum continued through the whole of Tibet, nor that this country was quite filled up with nearly parallel ranges the whole way up to the Kwen-lun. The harm done by such names as Katchi and Khor was, however, not very great, especially not if they were used as signifying a range which may be regarded as a forerunner to the prolonged Kara-korum. Speaking of the Kara-korum, »afterwards called Kuen-lun», WILFRED L. HEELY in a review on works by GEORGI, TURNER, HUC, KÖPPEN, SCHLAGINTWEIT, a. o., mentions the plateau that lies »between the Kuen-lun and that other parallel range which bears on the maps the name of Chor-Kachi».²

The brilliant scholar, Sir HENRY RAWLINSON, with whose views we have been dealing at several previous occasions in these volumes, cannot be said to have been fortunate in his orographical deductions. In 1875 he returns to the mountains of Western Tibet saying:³

Whether the Kara-Koram and Kuen-Luen are the southern and northern crests of the great range which bounds the high table-land of Thibet, according to the mountain system of Humboldt, or whether the names do not rather apply to two culminating ridges

¹ *Essays on the Languages, Literature, and Religion of Nepál and Tibet*. London 1874. Part II, p. 65.

² *The Calcutta Review*. Vol. LIX. Calcutta, 1874, p. 144.

³ *England and Russia in the East*. London 1875, p. 213.

which are western and eastern portions of the same range, as the Messrs. Schlagintweit first asserted, and as the observations of Mr. Johnson, in his journeys between Leh and Khotan, would seem to show, is of no very great geographical consequence. It is certain, at any rate, that the south-western or Kara-Koram ridge, the pass over which, forming the main road between Thibet and Yarkand, rises 18,341 feet above the level of the sea, is the true watershed between India and Central Asia, the Indus absorbing all the streams which flow from the southern slope of the range, while the northern rivers, which form the Kará-Kásh and which were followed by the Schlagintweits and by Johnson, force their way through, or round, the outer barrier of the Kuen-Luen, and went north-east-ward to the Gobi or Sandy desert.

The orography in this passage was not quite up to date in 1875! It was of a very great geographical consequence to know whether the Kwen-lun and Karakorum were one or two ranges. It is somewhat bewildering to learn that the SCHLAGINTWEITS asserted the two names were applied to the western and eastern portions of the same range, when we remember that 14 years earlier, or in 1861, the German explorers wrote: »We are fortunate enough to have been the first Europeans that ever crossed the chains of the Kara-korúm and of the Kuenlúen; Dr. Thomson had proceeded so far as to reach the Karakorum pass, but the Kuenlúen . . . had hitherto remained a perfectly unknown and unvisited territory.»¹ And how it is possible to talk of *one* range on JOHNSON'S map² is not easier to see. The latter half of Rawlinson's passage is correct and contradicts the first half.

In his opinion Leh

is much more convenient than Cashmere for communication with Northern India. If it be true, indeed, according to the information supplied to Mr. Johnson at Khotan, that by proceeding seventy or eighty miles to the south-east, the Kuen-lun mountains may be turned, and wheeled carriages can thus pass along an elevated table-land by Rodokh and Gardukh to the immediate back of the Himálaya range, we may expect in due time that the great Hindustan road will be prolonged from the Niti Pass so as to open out upon these uplands, a direct line of traffic being thus secured with Tartary, which shall be independent of the difficulties both political and geographical, that are attached to the old route by Cashmere and Ladakh.

This route of JOHNSON was known to MOORCROFT, CUNNINGHAM and H. STRACHEY. RAWLINSON says: It was known in the country as a royal made road from the Niti Pass *via* Gartok and Rudok to Khotan. He believes it was made by the Delhi emperors for serving trade between India and China. Curiously enough he, however, supposes that this royal road passed to the west and not to the east of the Kwen-Lun.³ The prospect was darkened by Shaw, who had received information about certain difficulties on this road.

Rawlinson seems not to have had any confidence in the SCHLAGINTWEITS, but, regarding the enormous services they made to a geographical knowledge of western

¹ *Vide supra* p. 222. And still this passage is quoted by Rawlinson in a note.

² *Vide* Pl. LIV, *supra*.

³ *Op. cit.*, p. 217. note.

Tibet, his verdict is certainly very unjust. Similar mistakes as those of the Schlagintweits have been made by all explorers, but no explorers of their time had promoted science to such a wide extent as they did. Rawlinson says:

It is true that they ascended the Kara-Koram pass and made a *détour* beyond the range in the direction of Khotan, which occupied them for twenty-six days and extended to about three hundred miles, but they seem to have been as unsuccessful both in observing and recording their observations, as they were bold in assigning positions on insufficient evidence.

Sir Henry Rawlinson made a mistake himself in defending on insufficient evidence the theory of a plateau-land which could be travelled over by wheels from the Niti Pass to Khotan.¹ It is true that the Schlagintweits were mistaken in saying they were the first Europeans to cross the Kara-korum and Kwen-lun, as it had been done before both by YEFREMOFF and DANIBEG. But this is a mere question of records, and I think very few geographers had ever heard the names of the two Russians. In the popular account of their journeys, HERMANN VON SCHLAGINTWEIT says everything that can be said of Danibeg.² Sir Henry once more returns to the great features of the orography.

The whole country between India and Tartary may be considered as one broad mountain range, the Himálayas forming the southern crest, and the Kuen-Luen the northern; while the interior is sometimes cheered with lovely valleys like Cashmere, but is more usually broken into rocky ravines, through which the affluents of the Indus force their way towards the plains, or else stretches away in those vast treeless uplands which are one of the chief characteristics of the range through its whole extent.

There is a northern »range» — the Tian-Shan.

According to Humboldt's system, which is still adopted generally as the groundwork of our maps of Asia, the northern and southern ranges were united to the west of Kashgar by a transverse ridge, which he names the Belút-Tágh, or »Cloud Mountains»; but recent observation assures us that there is no such separate connection chain.

At the S. E. extremity of Pamir the table-land is lost in the rocky summits of the Muz-tágh.

¹ I don't know whether it was on account of this extraordinary view that statesmen once talked of a railway across the Kara-korum. Dr. E. SCHUYLER says: »Subsequently it was proposed, instead of M. de Lesseps' railway to Tashkent, Samarkand, Kabul, and Peshawur, to turn it eastward from Tashkent to Khokand and Kashgar, and then over the Karakorum to Ladak, a work which would demand more engineering skill than any railway yet constructed. The divergence in views of the Russian and English Governments, with regards to Asiatic affairs and the character and political condition of some of the countries through which a railway to India must pass, will probably for a long time prevent the construction of any such railway, and therefore, so much of it as concerns India may be left out of the question.» *Turkistan. Notes of a Journey in Russian Turkistan, Khokand, Bukhara and Kuldja*. Vol. I. London, 1876, p. 223.

² *Reisen in Indien und Hochasien*. Vol. II, 1871, p. 6, and Vol. IV, 1880, p. 297. Richthofen says: es ist das Verdienst der Herren v. Schlagintweit, durch ihre Reise über den Pass hinweg nach dem wirklichen Zug des Kwen-lun die Trennung der beiden Gebirgszüge nachgewiesen zu haben. *China*, I, p. 228.

The northern crest, which under the names of Kuen-Luen, Karakoram, and Múztágh, runs into Pamir, is prolonged to the west above Badakhshán, and forms the watershed between the Oxus and the Cabul river, continues under the names of Koh-i-Bábá, Hindúkúsh, &c, to the north of Cabul, and finally traversing Khorassán at a much diminished altitude, reappears in the Elburz, to the south of the Caspian.

A very good map by ARROWSMITH accompanies the work. Here the Karakorum, the Muztagh, the Hindu-kush, the Kuh-i-Baba and the Siah-kuh form *one* long range.

Captain H. TROTTER, in 1877, gave the following description of a more easterly road across the Kara-korum and Kwen-lun.¹

The road from Noh skirts the Pangong Lake, which at Noh is joined by a stream from the north-east, up which goes a good road to Khotan, via Polu and Kiria. — The distance to Khotan by this road is about 450 miles. For a distance of 40 miles from Noh it gradually rises to a height of 15,000 feet, and then for about 160 miles as the crow flies, crosses, in a north-easterly direction, a series of elevated plains and ridges, before it descends somewhat suddenly to the plains of Eastern Turkistán. The average height above the sea-level of the halting-places on the elevated plain to the north of Noh is 16,500 feet. This vast highly-elevated plateau over which the road passes is the eastern continuation of the Ling-zi-Thang and Aksai Chin plains, which lie at a similar, or in places even higher, elevation in a north-westerly direction from Noh, between the Changchenmo River and the Kuen Luen Range, and have to be crossed by the traveller who adopts the Eastern (or Chang-chenmo) route between Leh and Yarkand.

It has been said above (Vol. III, p. 184) that TR. SAUNDERS regarded the Kara-korum as a »range».

His own words are: The upper valleys of the Sanpu, the Satlej, and the Indus appear to form a huge elevated trough separating the Himalaya from the northern part of the table-land of Tibet, and from the snowy range into which that table-land contracts at its western end. This range is crossed by traders in its narrowest parts, through the Mustagh pass, and also through the Karakorum pass.

He regards the Tibetan plateau as extending from the Upper Indus and Tsangpo on the south to the plains of Gobi on the north. The »Southern Chain» which in reality is the same as my Transhimalaya, he called Gangri or Gang-disri, so far as it separates the Tsangpo and Indus basins from the elevated lake basin of the Tibetan plateau. And he is partly right in his theoretical conclusion that the »Karakorum Range» is a continuation of the Gangri-Mountains. In opposition to SHAW he proves that the Kara-korum *is* a range on account of its height, its length exceeding 300 miles, and its function as a water-parting.

Regarding the Kwen-lun Mountains, they are believed to extend continuously between the Tibetan Plateau and the Gobi Desert. At the western extremity of the plateau they were known to do so and to continue as far east as $81^{\circ}30'$. The

¹ *Journal Roy. Geogr. Society.* Vol. 47, 1877, p. 90. He refers the reader to Route XIV of Section G. of *Geographical Appendix to the Report on the Survey operations in connection with the mission to Yarkand in 1873*, 74.

ranges crossed by HUC and PRSHEVALSKIY in the east were said »by various authorities» to be a continuation of the Kwen-lun. The most important missing link in this chain was, as we know, found by Prshevalskiy on his expedition to Lop-nor.

In 1870 Saunders had expressed the view that the Kwen-lun, Himalaya, Pamir, and Hindu-kush unite in the Pusht-i-khar or Taghdumbash. He did not mention the Kara-korum which he regarded as a part of the Kwen-lun. Regarding this »range» he says:

From the Hoang-ho westward to the Mustagh, lofty mountains, under various names form the northern edge of Tibet, and descend to the great pastoral plains of Gobi, in the Chinese government of Ili. These mountains are sometimes known as the Tsung Ling, or Mustagh, on the west, and the Bayan-Kara-Ula in the east; but the entire range is generally called Kuenlun.

As to the eastern continuation of the Kara-korum he did not seem to be quite convinced. He felt inclined to put it at the »Kara-kash Pass», but left the question open whether it extended farther eastward:

The Karakoram mountains part the Indus basin from that of Lake Lob. Recent explorations by the Changchenmo route from Lahore to Yarkand enable the geographer to define the eastern limits of this range, as the pass which connects the head of the Kara-kash valley explored by Mr. Hayward with the Shyok valley. This pass is proposed to be called the Karakash, after the river of that name. . . .

If the range is considered to extend further eastward, then its northern slope falls upon the highly elevated plateau which drains into the Tibetan system of lagoons and lakes. The base of the northern slope is then found to be 17,000 feet above the sea, and on a plateau bounded further north by another range of mountains, which rises to altitudes of nearly 22,000 feet and probably more, before descending northwards to the valley of the Tarim. The latter range is the Kuenlun, which finds its western extremity on the right bank of the Yarkand river, the left bank of the river being formed by the spurs of the Karakoram and Pamir. The preceding range dividing the Indus from the basins of the Tibetan lakes, and commencing with the Karakash pass, should, it is thought, be considered a part of the great system of mountains which surrounds the elevated Tibetan basin towards the south, and forms the waterparting between it and the basins of the Indus and Bramaputra.¹

On his map of 1870 (Cp. Vol. III, Pl. XX), Saunders has a gigantic mountain system beginning with the Bolor M^s in the N. W., stretching S. E. including the Kara-korum, turning east, including the Transhimalaya, and finally turning N. E. in the direction of the sources of the Yellow River. South of Khotan the Kuen-lun M^s branch off to the east, forming a boundary wall between the Plateau of Tibet and the Gobi or Great Desert.

Finally, it is of interest to see how the great orographical features are dealt with by such a learned scholar as JAMES D. DANA. The loftiest of mountains, he says, is called the Himalaya as far as Kashmir, »and from there, where a new

¹ *A sketch of the Mountains and River Basins of India.* London 1870, pp. 7 and 28.

sweep in the curve begins, the Hindoo Koosh.... The Kuen Lun Mountains to the north of the Himalayas make another crest to the great chain with Tibet between the two.»

He has a diagram from S. to N. through Asia, where the following features are mentioned: the elevated land of India, the low river-plain at the base of the Himalayas, the Himalayas, the Plain of Tibet, the Kuen Lun Ridge, the Plains of Mongolia and Desert of Gobi, intersected by the lofty Tian-shan Range, the Altai, and, finally, the Siberian Plains.¹

Kara-korum was sufficiently well known in 1880 to be included in an enumeration of this kind. On the other hand, it was obvious enough that there could be no Transhimalaya in DANA'S profile.

* * *

Though the work on Central Asia by MIR ABDUL KERIM BOKHARI belongs to a much earlier period, an extract from it may be inserted here, as the excellent translation of SCHEFER was published in 1876.

In one of the last chapters of this work *Khorassan, Tibet, Kachmir*, we find a very good description of the caravan road over the Kara-korum Pass. One has only to remember that Ladak and Leh are, as usual, called Tibet. Mir Abdul Kerim says:

Les caravanes se rendent du Tibet à la ville de Yarkend, qui est sous la dépendance de la Chine: elles parcourent cette distance en quarante étapes à travers une contrée où l'on ne rencontre ni ville, ni habitation. Le bois et les fourages y font défaut, mais on y trouve de l'eau; c'est un pays couvert de montagnes noires et arides; il n'y a sur la route ni voleurs ni brigands. Les gens qui vont du Tibet à Yarkend et ceux qui viennent de Yarkend au Tibet emportent avec eux pour quarante jours de vivres, du pain, de la graisse et de la viande. On voit dans le désert des corbeaux noirs, qui se précipitent sur les chevaux tombés de fatigue et leur crèvent les yeux.... Cette route est extrêmement difficile et pénible. Il s'élève aussi du sol des vapeurs chaudes semblables à celles du *simoun*. Quand une personne marche lentement, ces vapeurs lui montent au cerveau et lui causent une indisposition semblable à celle que l'on ressent en mer à bord d'un navire, quelquefois on en meurt. Pour se préserver de leur influence, on se met une gousse d'ail dans le nez, ou bien on boit de l'eau dans laquelle on a exprimé le jus d'un citron et fait infuser de l'ail. Ces vapeurs délétères font périr beaucoup de chevaux.

Quand un marchand veut transporter dix charges de marchandises, il doit se pourvoir de vingt chevaux pour porter, en outre, l'orge, le pain et les autres provisions; il arrive quelquefois que tous les chevaux viennent à périr; alors on empile les ballots les uns sur les autres et on les couvre d'une natte ou d'une feutre, sur lesquels on entasse des pierres. Si le marchand se rend du Tibet à Yarkend, et s'il se trouve plus rapproché de la ville, il abandonne ses marchandises, et, avec ses compagnons de route, il va à Yarkend pour y acheter des chevaux; il revient et charge ses ballots. Si le marchand qui se

¹ James D. Dana, *Manual of Geology*. Third Edition. New York, 1880, p. 26.

rend de Yarkend au Tibet voit mourir ses montures, il examine quel est l'endroit le plus rapproché pour s'y rendre et en ramener des chevaux. Les ballots peuvent rester exposés dans le désert pendant plusieurs années sans éprouver le moindre dommage.¹

He describes the »qouthas» or wild yak which he says is common all along this road, and is domesticated and used for transport in Tibet. He says that he »who has written these pages, the poor Mir Abdul Kerim of Bokhara», has undertaken this journey between Yarkand and Tibet.

Mir Abdul Kerim has also a chapter about Tibet itself, which however, contains very little of importance. He says:

Le Tibet est un Pays montagneux situé entre la Chine et l'Hindoustan; il s'étend sur une grande longueur et sur une grande largeur; ses montagnes s'élèvent jusqu'au ciel; ces routes sont aussi pénibles à franchir que le coeur des avarès est difficile à emouvoir. Il faut trois mois pour parcourir le Tibet. La capitale se nomme Lambèh (Lombou), c'est la ville de Qalmaq et la résidence des Lamas.... La ville de Lambèh est placée sous l'autorité de l'empereur de la Chine. Dans les montagnes du Tibet, on trouve une population nomade et vivant sous la tente dans le désert; ces gens élèvent une grande quantité de brebis et de chèvres.

In Lombou, I suppose, we may recognize Tashi-lunpo.

¹ *Histoire de l'Asie Centrale (1740—1818) par Mir Abdul Kerim Boukhary publiée, traduite et annotée par Charles Schefer. Paris 1876, p. 234 et seq.*

CHAPTER XXXV.

RICHTHOFEN.

Already the title of RICHTHOFEN'S standard work,¹ the most remarkable and epoch-making ever written on the geography of Asia, points out the difference between it and its two great predecessors, RITTER'S *Asien*, and HUMBOLDT'S *Asie Centrale*. It is all built up on his own personal observations so far as China and some other parts of Asia are concerned. Ritter and Humboldt had to work their hard ways through heaps of documents. And still no other works have in the same degree developed geography to a science, all over the world. Humboldt's own journey to the Kirgis Steppe and Altai in 1829 did not lead to any great geographical discoveries, but with his sharp and trained eye he understood the general building of the continent, and his work on Central Asia is, in spite of several natural mistakes, a milestone in the history of Asiatic researches.

Comparable with it is Ritter's *Asien*, of which the first volume appeared in 1832, and which contains almost everything known about the great continent at his time.

Germany had given to the world a third Asiatic scholar who was greater than his great countrymen, FERDINAND VON RICHTHOFEN. For, while those were, to a great extent, compilers, Richthofen was one of the scientifically best prepared travellers who ever lived, and regarding the physical geography of Asia, unrivalled. Richthofen says of his two countrymen that they were no mere compilers in the ordinary sense of the word on account of their sharp understanding of the great features and the systematic, critical and philosophic way in which they interpreted the material existing from the very remotest times to their own days.

Richthofen shows how Humboldt's artificial and geometrical construction of the boundaries of »Central Asia» was not at all in harmony with the geological and interior structure of the continent, and, therefore, soon had to disappear, — and he

¹ *China, Ergebnisse eigener Reisen und darauf gegründeter Studien* von Ferdinand Freiherrn von Richthofen. Band I. Einleitender Teil. Berlin 1877.

accepts the name Central Asia, which had been abused in so many ways, only under condition that the *central* regions should be regarded in comparison with the *peripheric* ones.¹

Richthofen starts from the fact that the rivers are much better known than the mountains, and, therefore, he uses the hydrography for determining the boundaries of his different Asiatic regions. He separates the regions without outlet from those from which the water flows to the ocean. Thus Richthofen obtains the following three great regions or physico-geographical provinces: 1. Central Asia, which is bounded by the Tibetan Plateau to the south, the Altai to the north, the water-parting of the Pamirs in the west, the water-parting of the Chinese Rivers, and the Khingan Mountains to the east. 2. Peripheric regions are all those, from which the rivers flow to the ocean or to the Caspian and to Lake Aral. 3. The intermediate zone, situated between the first two and where regions which formerly had an outlet have been changed into ocean-drained or *vice versa*.

In the central regions all the products of decomposition have remained and subaërial deposits are common; in the peripheric regions lacustrine and fluvial deposits prevail. The final goal of the central destruction is to fill up all depressions and to level all mountains until a plain is formed. In the peripheric regions, on the other hand, the relative differences of height are more considerable. In the basins without outlet the evaporation is greater than the precipitation, so that the depressions cannot be filled with water, but only filled and levelled by detritus material in the course of time. Such depressions are, as a rule, steppes, and as their ground contains salt they could be called salt steppes.

What Richthofen says in general about all central depressions in Asia could particularly be said about those in Tibet:

Ist die Depression rings geschlossen, so breitet sich in der Mitte ein Salzsee aus, der in der Regel von salzigen Sümpfen umgeben ist; und in mancher ist nur ein Salzsumpf vorhanden, der zu einer gewissen Jahreszeit ganz austrocknen kann. Öffnet sich aber die Depression nach einer Seite gegen eine andere, tiefer gelegene, so fließen die vereinigten Gewässer nach dieser ab, und dann befindet sich der Salzsee in dem Boden der tiefsten Depression des ganzen Systems.

In Richthofen's opinion the changes of climate are the chief factor in the formation of self-contained basins, and if such a basin again gets an outlet, it is also a new change of climate that is the cause. The precipitation does not need a considerable augmentation for providing a basin with an outlet.

Richthofen even believes that the Koko-nor is in a state of rising and that its basin is approaching its flowing over. Between the feeders of the Yang-tse there are certain self-contained basins which indicate that the whole country around not

¹ Op. cit., p. 5.

long ago was a salt steppe, in which the erosion has made its conquest along certain lines. He believes that the Tengri-nor belongs to the same category as the Koko-nor, or that it becomes more and more filled and is losing in salinity.

The most remarkable form of intermediate (Übergangs-) regions between central and peripheric areas, Richthofen finds in Tibet. But he complains of the scanty knowledge of the country, and finds the results of the Pundits of MONTGOMERIE insufficient.¹ However, he goes too far when he concludes that the four lakes N. E. of Tengri-nor, which were represented on maps even in 1877, in quite a recent time should have got an outlet through the Nak-chu or Khara-ussu, for most of these lakes have in later years been proved not to exist. And in the same way his hypothesis regarding the Koko-nor and Tengri-nor cannot be correct.

A great portion of those regions in Eastern Tibet which send their rivers to the sea, are, according to Richthofen, well developed löss-regions. He compares the Brahmaputra basin with the Upper Hwang-ho, where one self-contained basin after another has been captured by the drainage and transformed into peripheric country with outlet. He thinks that this change has taken place simultaneously with the last epoch of upheaval of the Himalaya, and that the high ranges of Tibet took part in the same upheaval, which also caused the glaciers to grow bigger and the rivers to become more abundant in water. As compared with this fact, every supposition would be hypothetical. What ever the causes may have been which brought the rivers to increase in such a high degree, it may be presumed that, as soon as the outlet to the sea was restored, even a small precipitation was sufficient to keep it running and open.

Richthofen explains the formation of Panggong-tso in a quite different way than the explorers who had been at the lake. He quotes SHAW who, like all other travellers, regards the high terraces at Drugub as formed by the slow drying up of the lake. But he reminds us of the phantastical in this view which is so strongly contradicted by the existence of the low threshold to the Shayok. After having considered the different descriptions, of which that by GODWIN-AUSTEN is the best, he concludes that the Panggong basin at an earlier epoch was a self-contained steppe-basin which became filled in a subaërial way — at its edges to an altitude of several thousand feet. Later on the basin got an outlet which cut itself down to considerable depth. At the same time the masses of deposits were pierced and dug out by radial gorges. Thus the former salt lake became fresh, and fresh-water molluscs could live in it. Finally the outlet again was cut off, the lake dwindled, and became salt as

¹ The descriptions provided by them are not sufficient to give us a clear idea of the configuration of the ground. Their astronomical and hypsometrical observations, and their route-surveys are, on the other hand, valuable. Op. cit., p. 129.

before; life ceased, and the conditions of subaërial deposition returned, and continue even at the present day.

As CUNNINGHAM, the SCHLAGINTWEITS and others really proved that the lakes formerly had been bigger, the false theory that all terraces were lacustrine, was accepted.

Regarding the relations between the lakes and rivers of Tibet and the climatic changes, Richthofen has the following important theory:¹ The salt lakes actually existing in Western Tibet are the remains of larger lakes existing in bygone times. Some of these had an outlet allowing animal life. This period, with more abundant precipitation than nowadays was preceded by a much longer period with dry climate and small salt lakes. The valley of the Indus in those early days consisted of a series of basins without outlet. At that epoch the subaërial processes were active in filling up the depressions even to the passes of the surrounding mountains and probably still higher. In this way the trough and basin-shaped plains were formed, the surface of which at the edges reaches several thousand feet above the lakes and rivers, which in our days are seen in the deep central parts. The transition from the earlier to the later period took place by a gradual change of the climate by which the self-contained lakes increased in size and, as now the Koko-nor and Tengri-nor, occupied a comparatively large area of their basins. Some of them finally got an outlet and joined each other into systems which, by way of the Indus, found their escape to the sea. The Indus, therefore, according to Richthofen, was formed in the same way as the Hwang-ho. Further he says that the rivers during the period of outlet worked their beds deeper and deeper; in this manner lateral gorges with terraced slopes were formed in the steppe deposits. With the beginning of the dry climate of the present period, those lake basins that had no outlet decreased in size, whilst others, whose canals of effluence had not yet eroded their beds *au niveau* with the bottom of the lakes (as *e. g.* the Panggong and Tso-moriri) were cut off. Naturally the area of all decreased and the salinity increased. Such basins which, as the Chang-chenmo, had already been formed into river systems, by the enormously energetic activity of their effluents, remained as such in spite of the desiccation.

Any attempt to explain all these phenomena in a perfectly reliable way, to find their relations to the ice-periods *etc.*, would at present be only hypothetical. It can be done only after a thorough geological survey of the whole of Tibet and the surrounding regions. Richthofen, however, more than forty years ago, has shown the way, and he has had several successors, amongst others LÓCZY and HUNTINGTON.

Our knowledge of the orography of eastern Asia was chiefly prepared by KLAPROTH'S researches in Chinese geographical sources. But, as RICHTHOFEN puts

¹ Op. cit., p. 137.

it, Klaproth provided only the stones, with which HUMBOLDT tried to construct the architecture of Asia. Klaproth's map (Paris 1836) was, however, a masterpiece and the first to bring light into the geography of Central Asia. Humboldt's geometrical construction proved to be false in many places, and right in others, but it worked in a high degree as an impetus to new researches.

Of the hypothetical prolongations of Humboldt's four ranges, only the Kwen-lun Range and its continuation into China was, as Richthofen remarks, a happy idea. All the others have proved to be »artificial constructions». Bolor-tagh has only a conditional existence.

Nur allmählig ist eine verbesserte Gebirgskunde an die Stelle des geistvollen Schemas getreten, und noch sind wir erst bei den Anfängen derselben. Vorsichtig können wir Einzelnes construiren. Die Gesamtkenntniss ist noch in grosser Ferne. In vielen Fällen aber verleitet das Streben nach einer klaren Anschauung auch jetzt zur hypothetischen Ergänzung desjenigen was festgelegt ist.

This was said 40 years ago and has so far proved to be right. It is true that since Richthofen wrote we have approached the final understanding considerably, but in some regions, as in the mountains around the Indo-Chinese rivers and in the interior of Tibet, we are only at the beginning. So far as my own Transhimalayan region is concerned, only the first step of the pioneer has been taken. Therefore, Richthofen showed how erroneous many hypothetical ranges must have been in 1877, especially in regions which were not yet open to exploration. Our maps of China used to represent mountain ranges wherever water-partings were situated.

In the seventh chapter¹ of his work, Richthofen has collected all known facts about the orography and geology of, and exploration in, the Kwen-lun »and the mountainous country south of it».² We miss only the names of HODGSON and SAUNDERS, for in their theories Richthofen seems to have had no confidence at all.

He regards the Kwen-lun as the back-bone of eastern Asia. It stretches eastwards and its prolongation divides China Proper into two halves very unlike each other. In the heart of Asia it also plays the part of a great dividing wall. He gives it a length of 42 degrees. Already at the end of the silurian age it rose as a considerable system. Richthofen found in its eastern portions that it never since the silurian age had been covered by water, even if it had undergone several other changes. STOLICZKA proved that the conditions were the same in the west, pointing to the great homogeneity of the whole system. For a considerable length in China, it is the water-parting between the Hwang-ho and Yang-tse. As to the Tibetan portion of the Kwen-lun, Richthofen's knowledge was, of course, insufficient; he did not and could

¹ Op. cit., p. 222.

² Richthofen's description of the Kwen-lun as well as the results of expeditions undertaken since China, Vol. I was published, have been thoroughly discussed by GEORG WEGENER in his: *Versuch einer Orographie des Kwen-lun*. Inaugural-Dissertation, Marburg 1891.

not know PRSHEVALSKIY'S discoveries and great parts of his central Kwen-lun were merely hypothetical, and his theories have, in many details, since then proved to be wrong.

Considerable length, old age and homogeneity are the principal characteristics of this system. Geologically it is independent, and the foldings of later epochs have not influenced it. In China, south of the Kwen-lun, the S. W. to N. E. stretching folds never cross it or form knots with it, but avoid it, as it were, turning E. N. E. and east, leaving it alone. On the northern side the N. E. stretching folds turn to the west. All folds in its neighbourhood have been formed after the upheaval of the Kwen-lun. Richthofen regards this system as one of the oldest features in the building up of the earth's crust.

In the east it is the mere ruin of an originally much higher mountain. The peaks have disappeared, only the great bulk or mass of the system is left. The peaks may have been much higher than those of the much younger Himalaya.

Even the name Kwen-lun is one of the very oldest in eastern Asia, dating from the mythical history of China. Later on it is generally said that the Kwen-lun was situated near the sources of the Yellow River. During the Han dynasty the myth arose that the source of this river was situated south of Khotan, from where the river went to Lop-nor, and thence flowed underground to reappear in the Hsing-su-hai or Star sea, where PRSHEVALSKIY found, if not its real source, at least something very nearly approaching it.¹ Thus Kwen-lun was regarded as partly south of Odontala. The name Kulkun, or Kurkun of Mongolian extraction, is much younger and has to disappear from modern maps.

Richthofen divides the Kwen-lun into three parts, of which he regards the western, between 76 and 89°, as a single, but broad, range. In its central part the system becomes very broad. The eastern or Chinese part we do not need to consider. Humboldt was the first to understand the orographical importance of the Kwen-lun. But he was wrong in connecting it with the Hindu-kush and making it continue as one range the whole way to Asia Minor, as the ancients had done. He regarded it as the water-parting between the Tarim and the Indus. Ritter adopted his views. Both placed a plateau-land between the Himalaya and the Kwen-lun. They could not suspect the existence of a tremendous mountain system between these two boundary systems. These appeared only by and by in the course of continued exploration. It was, as I have mentioned above, the merit of the SCHLAGINTWEITS to have proved that the Kara-korum was a separate system, independent of the

¹ On the presumed connection between the Tarim and the Hwang-ho cp. the excellent article of Dr. ALBERT HERMANN: *Die alten Seidenstrassen zwischen China und Syrien I*, in *Quellen und Forschungen zur alten Geschichte und Geographie*. Herausgegeben von W. Sieglin. Heft 21. Berlin 1910, p. 65. *et seq.* Cf. also Vol. VIII of the present work.

Kwen-lun. In some time, however, the view prevailed that there was only one tremendous mountain mass including all three systems, possessing high peaks as well in the middle as on the borders. Only geologically the orography can be understood and nobody has done more in the right direction than STOLICZKA.

Richthofen discusses the results of Stoliczka's researches and concludes that from the Indus to the Kwen-lun, nothing is younger than Trias. The Kwen-lun itself is of a very old age. As a rule the arrangement is the same as in the Chinese portion. Thus the Kwen-lun is the oldest of the whole series, and at its southern side the other mountain folds have made their appearance.

He regards the two opinions: the one accepting three ranges, Himalaya, Kara-korum and Kwen-lun, the other regarding the whole mountain mass as one single block, as being both partly wrong and partly right. So far as the unity is concerned, it may be said to be correct from a physico-geographical point of view. But this unity disappears if we follow the different systems in their continuation to the east. Only the Kwen-lun holds its direction and independence. But the country south of it changes more and more. Richthofen distinguishes two mountain systems: the Kwen-lun (W. N. W.—E. S. E., a direction which we now know is wrong from the meridian of Keriya), and the north-western Himalaya (N. W.—S. E.). Only the Kwen-lun remains a range, the Kara-korum and Himalaya broad highlands. He does not quite accept the view that the elevated ground with the Kara-korum Pass should be the same as the high Mus-tagh. But he is aware that the subaërial and lacustrine deposits hide very much of the relief. For the plateaux of Tibet are not founded on mountain structure, but are due to secondary phenomena, and, if a humid climate arrived, these plateau-forms would soon disappear. In the zone of syenitic gneiss only, we find a series of ranges, amongst which the K₂ Range is the most considerable. Until further information was brought back, Richthofen preferred to separate the Kara-korum from the K₂ Range instead of—as had been done—carrying the crest of the K₂ Range in a long curve along the water-parting of the Shayok and down to Chang-chenmo and Lake Panggong. In 1877 the country between Kara-korum and the southern foot of the Kwen-lun was too little known for allowing any conclusions as to its building.

The denudation has proceeded so far in the Kwen-lun that the average crest height is only some 700 or 900 feet lower than the peaks, a view that has to be much altered after the exploration of later years. In the Himalaya the average crest height is 4,800 m. and the summits up to 8,840 m. Thus the crest height of the Kwen-lun is so much higher than the crest height of the Himalaya, as the summits of the Himalaya are higher than the summits of the Kwen-lun.

The regions east of the Chang-chenmo route belonged still, in 1877, to »the least known parts of the whole earth», and for these regions Richthofen had to go

back to Chinese maps. Nowadays we know them fairly well. Richthofen had, however, at his disposition the itinerary of FORSYTH'S PUNDIT. The Chinese maps made it probable to him that far away to the east the Kwen-lun formed the front wall of the Tibetan Plateau. These maps seemed to indicate that mountains existed on the plateaux, *e. g.* on the diagonal road from Lhasa to Khotan. The lakes and rivers of the maps have names which seem to prove that Chinese travellers had been there.

The following passage is of special interest:¹

In welcher Weise der Gebirgsbau durch diese unbekannte Strecke fortsetzt, lässt sich gegenwärtig nicht ergründen. Alle Versuche, die in dieser Beziehung auf europäischen Kartendarstellungen gemacht worden sind, beruhen auf Vermuthungen. Nur am Südrand der abflusslosen Gebiete, gegen die Quellgebiete des Indus, Setledj und Bramaputra hin, sind einzelne orographische Thatsachen bekannt geworden; aber ehe die Ketten des Kailas oder Gang-disri, des Aling-Gangri und ihre östlichen Fortsetzungen nach dem Gebiet im Norden des Bramaputra nicht in das Netz der indischen Aufnahmen gezogen sind, und ihr geologischer Bau bekannt geworden ist, lässt es sich nur vermuthen, dass sie die Fortsetzung der im Nordosten von Skardo und Leh gelegenen Parallelketten sind, und östlich vom See Manasarovara die Richtung des östlichen Himälaya annehmen.

As there was a blank in his store of information regarding these parts, there is also a blank in his book. Nothing except the quoted passage is said about the then unknown country north of the Tsangpo, the country of the Transhimalayan System. This should be well observed and remembered by those who quoted the authority of HODGSON and SAUNDERS a few years ago: »All attempts that in this respect have been made upon European maps, depend upon conjecture.» And as conjecture and hypotheses in the field of scientific exploration are absolutely without any value, RICHTHOFEN, who otherwise tries to make the best use possible of Chinese maps and native information, does not even mention the names of Hodgson and Saunders and their theoretical Gangri Mountains, although he knew them very well and obviously means them when speaking of »European attempts». And still it is true that he has built up theoretical mountain ranges himself, which in the light of later exploration have proved to be wrong.

One of Richthofen's mountain systems very much reminds us of the system which SAUNDERS on his map drew from the Nien-chen-tang-la to the N. E. Richthofen thus speaks of a »remarkable line» stretching from the sources of the right tributaries of the Ki-chu of Lhasa in N. E. direction to the point where Bri-chu touches the western end of Bayan-khara-ula. This line indicates the zone where the gigantic rivers of south-eastern Asia have their beginnings. The feeders of Ki-chu, Lu-kiang and Lan-tsang-kiang have their sources on the south-eastern side, the feeders of the Murui-ussu on the north-western side. Some rivers pierce this line of mountains, for instance the Khara-ussu, or Nak-chu, which, as Richthofen puts it (p. 129), has in

¹ Op. cit., p. 252.

quite recent time captured the four lakes: Buka-nor, Eldzighen-nor, Dzida-nor, and Khara-nor, situated in a district still marked by all the characteristics of a steppe country. This view is wrong as the four lakes, as represented on older maps, do not exist, and those which exist at the place have no outlet to the east.

But from the existence of the sources of these rivers on the »remarkable line», Richthofen draws the conclusion that a tremendous threshold must be situated here, which is without a rival as a feeder of gigantic rivers. This threshold, he says, is also remarkable as a physico-geographical boundary between the steppe and desert highland of Khor to the N. W., and the deep-cut valleys to the S. E. In the N. W. the plastic of the ground is hidden by subaërial deposits, in the S. E. everything is opened up by the action of running water. But the boundary should not be supposed to be very sharp. Gradually one form goes over in the other. The relative height of this elevation must be considerable, — otherwise it could not catch the humidity of the S. W. winds, which are quite dry when reaching the steppes beyond.

Richthofen regards this elevation as very important in the orography of Asia, for, proceeding from west to east, it is the first range one meets having a stretching from S. W. to N. E. This direction prevails in what Richthofen calls the Sinian System. The imaginary range is also a boundary wall to the highland of Khor.

About his theories as to the existence of a north-east-wards stretching Tang-la Range, Richthofen adds a note saying that since he wrote the above passages in 1874, he had not changed his text in the least in 1877. He had built up his theory on Chinese authority alone. But later on he had obtained proofs which corroborated his views in the most striking way. The confirmation was given by the journey of MONTGOMERIE'S PUNDIT of 1872, who followed the S. W. portion of Richthofen's Tang-la for 150 miles, and found it stretching north-east-ward. And the Pundit found this portion of the range exactly where Richthofen from Chinese maps, had supposed it to be. One of the Pundit's snow peaks was the famous Nien-chen-tang-la, the existence of which was, however, known long before the journey of the Pundit. He points to the fact that the Pundit could see other snowy peaks stretching far away to the N. E. The Pundit thus had proved that the so far hypothetical Tang-la really existed in its south-western part, and as it here gave rise to many and abundant rivers running south-east-wards, Richthofen supposed that the case was the same the whole way in the N. E. continuation of the range.

The material brought back by HUC had not been sufficient for drawing such far-reaching conclusions. But after the Pundit's journey, Richthofen regarded the problem as solved. He did not recognize in the Nien-chen-tang-la Range an eastern continuation of the Aling-gangri Range, as he calls the one north of the Tsangpo. To him both were perfectly independent folds and belonged to different systems. The Aling-gangri belonged to the Himalayan System, the Nien-chen-tang-la to the

Sinian System. The Nien-chen-tang-la was the continuation of Huc's Tang-la, not of the Aling-gangri. Richthofen never suspected that Aling-gangri and Nien-chen-tang-la could be one and the same mountain fold, and, losing hold of the eastern fixed point, he had no possibility of interpolating the Central Transhimalaya. On his maps he draws his Aling-gangri Range far to the east and has even three parallel ranges north of the Tsangpo, but they are, as he says, perfectly conjectural, and otherwise he has not a word to say of them.

I do not know whether SAUNDERS has been influenced by Richthofen. Richthofen had made extensive journeys in Se-tchuan just east of Eastern Tibet. He knew better than any living man the eastern continuation of these Tibetan Mountains and he knew some of the rivers which take their rise from them. On Saunders' map the Gangri Mountains are orographically in connection with the Nien-chen-tang-la, whereas both are, on Richthofen's map, orographically and geologically independent of each other. That Richthofen did not get any impression whatever from HODGSON'S map, is obvious from the fact that Richthofen has three parallel ranges north of the Tsangpo, whilst Hodgson has only one.

In our days it has been proved by the journeys of ROCKHILL, WELLBY, BONVALOT, DUTREUIL DE RHINS and GRECARD, as well as by the PUNDIT A—K—and others, that Richthofen's Tang-la does not exist, and that the Sinian System, so far as Tibet is concerned, was merely a hypothetical construction. The S. W. to N. E. stretching of a whole series of ranges, as Richthofen would have it, is altogether against the orographical structure of this part of Tibet. The folds seem to be as regular here as in the rest of Tibet, although all of them make a sharp bend, turning down to the S. E. and south, more or less as the rivers do.

There must, of course, be an elevation on the eastern border of the »Highland of Khor«, or as we prefer to call it now, the plateau-land of Central Tibet, the Chang-tang. There is the extremely irregular water-parting between the self-contained basins of the interior, having no outlets to the sea, and, on the outer side, giving rise to the great Indo-Chinese Rivers. But this line of water-parting, *divortia aquarum* as HUMBOLDT says, is crossed at almost right angles by the mountain folds. It is a water-parting of the same kind, but on an incomparably greater scale, and of much greater geographical importance, than those which are so common on the highlands themselves, where you cross them every time you go from one basin to another. We have another example of the same kind of water-parting in south-western Tibet, namely between the western-most feeder of the Tsangpo and the eastern-most source of the Taze-tsangpo, that is to say, a low threshold in a latitudinal valley.

There is a good deal of precipitation even on the western side of the East-Tibetan water-parting. There are high mountains to catch the humidity. But by far the greatest part of the humidity is condensed on the mountains around and east of

the water-parting, and in this way the great rivers are born, not suddenly from a special line, marked by a very high range, but over a rather large area, where all crests, slopes and valleys send feeders down to the upper courses of the rivers.

The very great difference between the country west and east of this Tang-la line, exists anyhow just as Richthofen has described it. The country east of this line is, as he says, typically peripheric.

Nirgends ist der Gegensatz gegen die centralen Landschaften, in solchen Ländern, die ihnen benachbart sind, schärfer gezeichnet. Auf dem Plateau, wo die Zerstörungsproducte zurückbleiben, sind die Gebirge mehr eingehüllt und unkenntlicher, als wenn sie als Inseln aus einem Meer aufragten, denn dieses würde in einem bestimmten Niveau seine Grenze erreichen und darüber den Gebirgsbau klar hervortreten lassen, während die subärischen Schuttgebilde sich aus den Depressionen hoch nach den Abhängen hinaufziehen. Wie anders das Land aussehen würde, wenn dort den Gewässern gestattet wäre, den Schutt hinweg zu räumen und nach tiefern Regionen zu führen, das zeigt klar die östliche Hochgebirgslandschaft, welche sich mit anscheinend wenig verändertem Charakter bis weit über die chinesische Grenze nach Sz'-tshwan hin ausbreitet¹

As pointed out before, Richthofen has shown that the plateau character of Chang-tang is an entirely secondary phenomenon.

Regarding the Kwen-lun, he says that it consists of a broad series of tremendous parallel ranges which chiefly are situated in countries without outlet, and, therefore, ordinarily rise with soft undulating forms from the steppe deposits which fill the latitudinal valleys. Partly, however, they have been captured by the peripheric regions. This description would suit the whole country down to the Tsangpo. Almost all the ranges in the interior of Tibet are more or less parallel to the Kwen-lun and Himalaya, and the plateau ranges go, as I believe, slowly over into the eastern ranges near the upper courses of the Indo-Chinese rivers.

From the very scanty European information then existing, and from Chinese maps, Richthofen was able to follow seven parallel ranges of the Central Kwen-lun. It is unnecessary to enter upon his views here, as we have richer material nowadays and as the description of the Kwen-lun does not enter in the plan of this work. From Chinese sources Richthofen finds only one communication regarding the western part of the Central Kwen-lun, and that is about the sources of the Hwang-ho, which are placed, by the Chinese, west of Charing-nor and Oring-nor and Odon-tala in the Bayan-khara-ula.

When the first volume of *China* appeared, PRSHEVALSKIY had already finished his journey to Lop-nor, but it took some time before all his results were known. So, only a very short time after the appearance of *China*, the representation Richthofen had given to the Central Kwen-lun was antiquated and had to give way to a quite different conception of the ranges, especially south of Lop-nor. But

¹ Op. cit., p. 258.

Richthofen had correctly made the Koko-shili and Bayan-khara-ula as parts of one and the same fold. North of Odon-tala we find on his maps a nameless range, and north of it Shuga and Burkhan-Buda. The range south of Koko-nor he calls »Khukhu-nor-Gebirge»; it was called Southern Koko-nor Range by Prshevalskiy. South of the Koko-shili-Bayan-khara fold Richthofen had only two more folds and then follows the artificial construction of four great ranges, running S. W. to N. E. The western-most of them is the Tang-la. All four are cut through by the upper courses of the rivers. West of Tengri-nor is a short parallel range, the one which comes in contact with the eastern end of Aling-gangri. This range and the S. W. part of the Tang-la are, as it were, cut by the Nien-chen-tang-la. We have seen that SAUNDERS in this region has three tremendous ranges, more enormous than even those of Richthofen. He even goes so far as to make Himalaya continue uninterruptedly, to the N. E., and to make the Yunling Mountains of western China practically one and the same fold as the Himalaya.

On his map¹ Richthofen has two Kara-korum Ranges. Between them and the Kwen-lun there are two more which he obviously regards as belonging to the Kara-korum System. The Aling-gangri Range may be said to be the prolongation of his southern-most Kara-korum. In spite of a fairly long gap between the two, this view is, so far as I can see, correct, although new exploration has to solve the problem definitely. Richthofen's northern Kara-korum has no continuation at all in the interior of Tibet. It begins from the Kara-korum Pass and stretches S. E. to 80°. Therefore, of course, Richthofen never suspected that it could have anything whatever to do with HUC'S Tang-la far in the east.

Between his southern Kara-korum and the Indus there are four ranges, the two northern of which he calls the Dapsang Ranges. In their immediate prolongation the southern Aling-gangri Ranges are situated. All these Kara-korum and Dapsang Ranges, Richthofen regards as belonging to the Himalayan System.

Looking at Tibet as a whole we see that Richthofen gives it a triangular shape, where his »Hochland von Khor» is bounded by the parallel ranges of these mighty systems, the Kwen-lun, the Himalaya and the Tang-la or Sinian System.

The exploration which has taken place since his great work was published, or since 1877, has proved that this view is correct only so far as the Kwen-lun and Himalaya are concerned. In the east, where so much work is still left to be done, Richthofen's Sinian System will disappear altogether. Instead of the complicated and irregular construction he gave to these regions, we will find that the whole of Tibet is one single and rather regular system of folds, a »Faltenland» as the Germans say, and that this regularity continues the whole way to the east, where the mountain folds turn down to the S. E.

¹ Vide Vol. III, Pl. XXIV.

In our days only the southern and northern boundary systems are really well known, especially Himalaya. Richthofen gathered one of the principal features of Tibet when he showed that also the interior of Tibet was filled up by tremendous ranges, although hidden to a very great extent by deposits. So much of the ranges however, crop up from these beds of deposits that the general stretching of the ranges may be followed. The plateaux of Northern and Central Tibet grow smaller and smaller the more the interior of the country becomes known.

Richthofen drew up the principal lines of the geography of Central Asia in a systematic way. The representation he gave of the orography proved that HUMBOLDT'S System had to be abandoned on several points. At present many parts of Richthofen's own system have proved to be wrong, although the great features and the physico-geographical laws, which nobody has understood and interpreted better than he, will always remain, for they are eternal physical laws. And Richthofen's own name remains unrivalled in the history of Asiatic exploration.

In his *China*, Dritter Band, published by Professor ERNST TIESSEN, Berlin 1912, seven years after the author's death, Richthofen has brought together everything that was known of the geology of High Asia until 1896. From the Kara-korum he had only Stoliczka and Forsyth to quote.¹

In this third volume of his great work, Richthofen points out that at the time when he wrote his first volume, reliable information regarding the geology of Central Asia had only been brought back by PUMPELLY from Eastern Mongolia and by STOLICZKA from the west on a transverse line from Himalaya over Kashgar to the southern ranges of Tian-shan. The next step was taken 20 degrees farther east by LÓCZY in 1878. Then followed the important investigations of BOGDANOVITCH in the mountain ranges which to the south and west border the Tarim Basin. The next explorers are OBRUTCHEFF, POTANIN, GRUM-GRSHIMAILO and other Russians such as KOSLOFF and ROBOROVSKIY. The English and French explorers who in audacious campaigns have crossed Tibet, have not pursued any geological aims.²

The same formation, namely carbon, that Stoliczka had determined north of the Sanju Pass in 1874, was found by BOGDANOVITCH in Tekelik-tag south of Khotan and in the Tisnaf Basin south of Yarkand. The *Gryphaea* (-Mergil) discovered by Stoliczka on the way from Sanju to Yarkand was later on recognized to be eocean. Marine Trias in alpine facies had been found south of Western Kwen-lun and west of Kisil-yart in the Pamirs. In both regions these discoveries were made by Stoliczka. S. E. of Kara-korum middle, brown Jura has been determined from the upper reaches of Kara-kash.

¹ Vide supra Vol. III, p. 202 et seq.

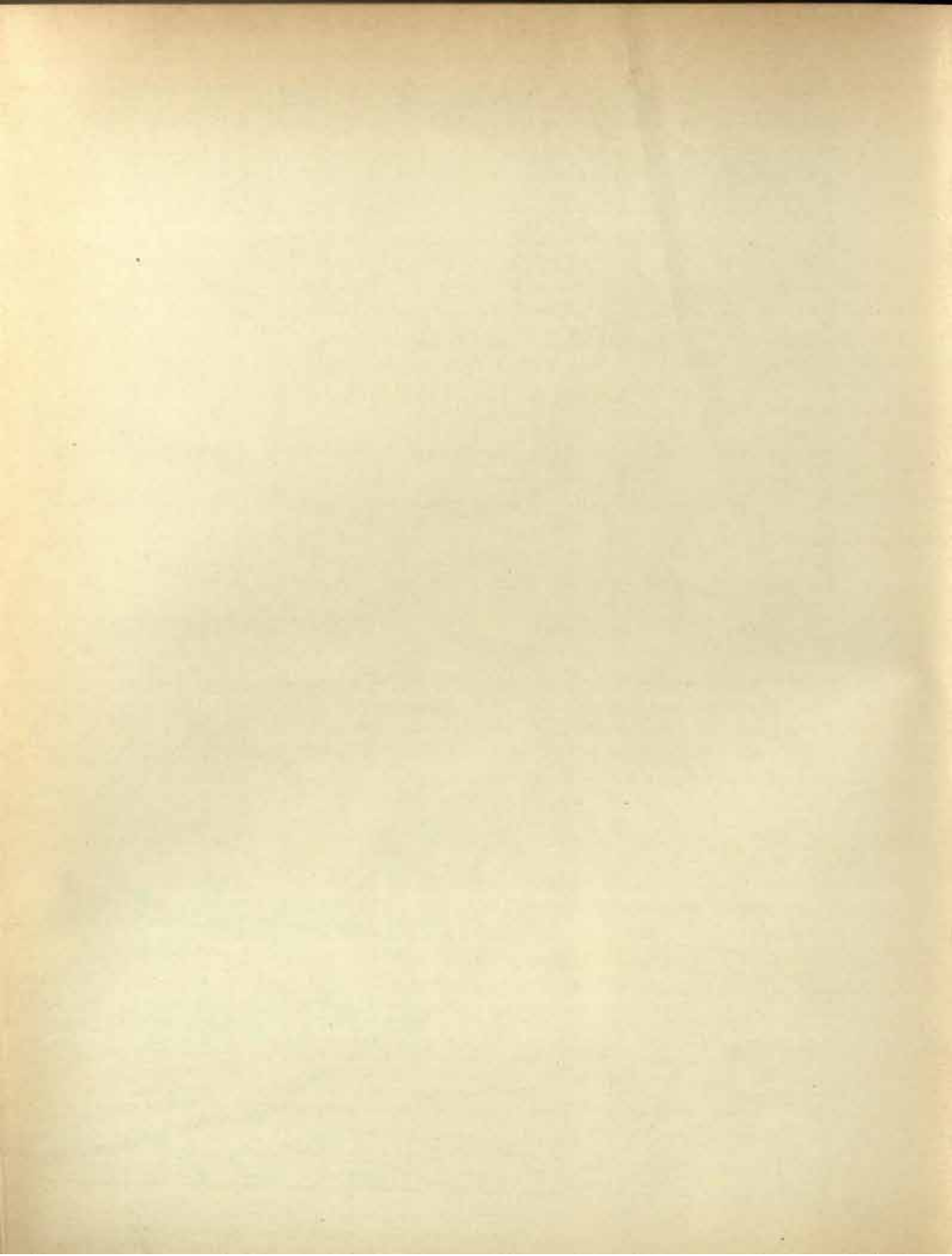
² Op. cit., p. 314.

As Pl. LXVI I insert a map drawn at Vienna in 1873, only a few years before the appearance of Richthofen's Vol. I of *China*.¹ North of Tibet it shows the Nan-shan (Njanj-Szanj-Gebirgs-Rücken) of the Chinese. A part of the Kara-korum is visible in the N. W. corner. The Lang-bu-zi Geb. traverses the whole of Tibet and has a certain resemblance to the eastern continuation of the Kara-korum as shown in the map of the SCHLAGINTWEITS (Cp. Pl. XIX, Vol. III). Between it and the Upper Tsangpo there are some conjectural ranges with unknown names. The Satlej is represented as taking its rise from the Rakas-tal, but there is no connection between the latter and the Sacred Lake. There is no resemblance whatever between this Austrian map and the one of Richthofen (Vol. III, Pl. XXIV), which is, of course, much superior.

¹ The title of the Austrian map is: *General-Karte von Central-Asien, bearbeitet nach den besten und neuesten russischen und englischen Quellen im k. k. militär-geographischen Institute in Wien. 1873.* (Massstab circa 1:2900000), 12 Bl., Bl. Nr. 9. Professor H. Meisner of the State Library in Berlin has kindly provided me with a copy of this map.



General-Karte von Central-Asien, bearbeitet nach den besten und neuesten russischen und englischen Quellen im K. u. K. militärgeographischen Institute in Wien 1873.



CHAPTER XXXVI.

NIKOLAI MIKHAILOVITCH PRSHEVALSKIY.

During fifteen years, 1870—1885, the Russian General PRSHEVALSKIY carried out his four memorable journeys which indeed opened a new era of Asiatic exploration. The regions he visited are situated east and north of the Kara-korum System, but his geographical and orographical discoveries are of such great importance for the conception of the Tibetan Highlands in general, that his name should not be missing in this account of travels and exploration. I will, therefore, mention a few of his most important contributions to our present map of Tibet.¹

Petermann's Mitteilungen, 1876,² contain a very good and scientifically condensed extract of the first volume of Prshevalskiy's narrative, embracing the results of his geographical discoveries and scientific observations. The value of this extract is highly increased by a beautiful map of PETERMANN, where the routes of some other travellers also are entered, *viz.* SHISHMAREFF 1864—1868, DAVID 1866, FRITSCH 1868—1872, RICHTHOFEN 1868—1870 and 1872, MATUSOVSKIY 1870, NEY ELIAS 1872, BUSHELL 1872, and SOSNOVSKIY 1875.

After having reached the Koko-nor on October 13th, 1872, Prshevalskiy crossed the two South Koko-nor Ranges, and the river Bayan-gol of Tsaidam. South of Tsaidam he found the range Burkhan Buddha, 200 versts in length, and traversed it in a pass of 15,300 feet. Crossing the Nomokhon-gol he reached the high plateau-land stretching all the way to Tang-la. Then followed the Shuga Range, and south of it, the Shuga-gol. Some 100 versts farther S. W. he reached the Bayan-khara-ula, on the left side of the Murui-ussu or Blue River. He, therefore, regarded this range as a watershed between the Blue and Yellow Rivers, and gave its length at 700 versts, which was, of course, very conjectural. In the west it was called Koko-shili,

¹ In 1891 I published in Swedish an abridged translation of his journeys: *General Prschewalskij's forskningsresor i Central-Asien*, with a preface of Baron A. E. NORDENSKIÖLD, 455 pp. and a map. — In my *Scientific Results*, Stockholm 1907, I have a chapter on Prshevalskiy. Vol. IV, p. 447 *et seq.*

² *Die Mongolei und das Land der Tanguten, Oberst-Lieutenant Przewalsky's Reisen 1870—1873*. Bd. 22, pp. 7, 94 and 164.

in the east, south of Odon-tala, Soloma. The system did not reach the snow limit, and it was lower than the two previous ranges. Between the Shuga and the Bayan-khara-ula an undulating desert was found at 14,500 feet. In the N. W. part of this desert rose the gigantic snow mountain, Gurbu-naidshi, which he regarded as the eastern-most part of the Kwen-lun. In January 1873, he reached the Murui-ussu (Murusu), coming from the Tang-la. We have already dealt with his experiences on the Tang-la.¹ From here he returned to the north.

Prshevalskiy's second journey took place in 1876 and 1877, started from Kulja, and proceeded across the Tian-shan to Lop-nor and Altyn-tagh.² Marco Polo was the first to tell Europe about the Desert of Lop, and since his time the Desert of Lop had figured on most maps of Central Asia. RICHTHOFEN says that Prshevalskiy's discovery of the Altyn-tagh (Astin-tagh) was the most surprising of all during this journey.³ The discovery of this range was of the same importance for geography as for the understanding of Central Asian communication. It at once became obvious why the old silk-roads between China and the west passed immediately south of Lop-nor. The Altyn-tagh was found to stretch south-west-wards and to stand like a wall between the highlands and the lower desert uninterruptedly to Keriya and Khotan. SHAW had heard the name Tokos-dewán (Tokus-davan), which Richthofen thought was rather a road with nine passes connecting Tsaidam, Koko-nor and Sining-fu with Khotan. Richthofen could hardly believe in this unexpected stretching of the ranges south of the eastern half of Eastern Turkestan.

Wenn hiernach die für die supponirte Gebirgsmauer angenommene Bezeichnung fallen muss und eine andere Bedeutung erlangt, so sprechen neben der eminenten Unwahrscheinlichkeit noch manche positive Gründe gegen die Existenz der von S. W. nach N. O. gerichteten Gebirgsmauer selbst. Einmal wissen wir aus übereinstimmenden Erkundigungen von Johnson und Shaw, dass der Weg von Kiria aus erst seine frühere Richtung (also wohl ungefähr OzS) weiter innehält, dann aber einen Bogen macht und beinahe direct nördlich geht. Unter den Gründen, welche dies veranlassen können, ist der wahrscheinlichste der, dass ein nördlicherer Gebirgszug nach Westen vorspringt und umgangen werden muss. Ferner erfuhr Shaw, dass man auf dem Weg von Kiria nach Tschertschen zur Rechten in der Ferne bei klarem Wetter schwarze, d. i. schneefreie, Berge sehen könne.

In accordance with this theory, RICHTHOFEN has drawn his maps of *China I*, though independent of Prshevalskiy's discoveries. The Russian explorer on later journeys got opportunities to prove that the information he had got from the natives was correct, and that there indeed existed a great mountain range stretching N.E.—S.W.

¹ *Vide supra*, Vol. III, p. 159 *et seq.*, and Vol. VII, p. 212 *et seq.*, *supra*.

² The narrative has been translated into English by DELMAR MORGAN, *From Kulja across the Tian-shan to Lop-nor*, London 1879, and in *Petermann's Mittheilungen*, Erg.-Heft, No. 53, Gotha 1878. Cf. also my *Scientific Results*, Vol. II, p. 267 *et seq.*

³ *Bemerkungen zu den Ergebnissen von Oberstlieutenant Prjewalski's Reise nach dem Lop-noor und Altyn-tagh.* — *Verhandlungen der Gesellschaft f. Erdk. zu Berlin.* Band V, 1878, p. 121 *et seq.*

along the southern border of Eastern Turkestan. Our knowledge of the geography of Central Asia was, as Richthofen puts it, enormously increased, and our interest stimulated by the journey of this single man. In opposition to all traditional conception, the wall-shaped edge of the Tibetan plateau-land had been found immediately south of Lop-nor.

In his preface to the German translation quoted above, Dr. A. PETERMANN expressed himself in enthusiastic words on the importance of Prshevalskiy's discoveries, and says that the great features of the interior of Asia now were practically known. In the following very clear words, he sets forth the essence of the problem:

Przewalsky hat das Verdienst, hier die erste feste Bestimmung gegeben zu haben. Aber noch mehr. Nach den bisherigen Karten und Vorstellungen lag die Lob-nor-Senke weit jenseit des grossen Asiatischen Gebirgs-Massivs und näher am Thian-Schan-System, nach Przewalsky bildet sie aber den Fuss des Kuenlun, also jener gewaltigen Gebirgs- und Plateau-Region, welche sich von den Ebenen Indiens über den Himalaya, Karakorum, das Hochland von Khor ununterbrochen bis zu dieser nördlichen Kette erstreckt. Przewalsky's Altyn-tag bildet den nördlichsten Abfall des Kuenlun.

In 1879—1880 Prshevalskiy undertook his third journey of exploration in Central Asia, from Saisan *via* Hami to Tibet and to the upper course of the Yellow River. In the preface to his narrative he calls his expedition »a scientific reconnoitring in Central Asia«. Like the first two expeditions, the third one was of very great importance, and brought back an amount of geographical knowledge. Now he again crossed the Tang-la, presumably the eastern continuation of the northern Kara-korum, and he gives a more detailed description of it than after his first expedition. I have translated the following passage from his own original text.¹

As soon as one has crossed the Mur-usu the ground begins to rise towards the south,

and forms here an extensive plateau, perhaps one of the very highest in Northern Tibet. On the crest of this plateau stretches due east and west a range with eternal snow, known under the name of Tan-la. This name belongs perhaps, also to the plateau as a whole, from which, at different places separate mountain groups rise, some of them with eternal snow. Such groups and mounts were, for instance, Medu-Kun, Dorsi, and Joma on the northern side of Tanla. The ground between these groups is rolling so that the plateau of Tan-la, as a rule, represents an undulating surface. The slope, both at the northern and the southern side, is very gradual, although the pass itself on the road of the Mongolian caravans has a height of 16,700 feet. But in spite of this very considerable height, the summit of this pass rises only 2,100 feet above the valley of Mur-usu, and 2,000 feet above the valley of San-chu flowing along the foot of Tan-la's southern slope. However, the rise to this plateau is, on the northern side, 125 versts, and the slope on the

¹ Н. М. Пржевальский: *Третье путешествие в Центральную Азию. Изъ Зайсана через Хами в Тибет и на верховья Желтой Речки*. С.-Петербургъ. 1883, p. 233 *et seq.* Parts of the chapter here quoted have been inserted in an article entitled *Über den Oberlauf des Jang-tse-kiang und das Tan-la-Gebirge 1879—80*, *Petermann's Mitteilungen*, 29. Band, 1883, p. 345 und 376.

south, 75 versts, that is to say 17 and 27 feet respectively on each verst. The gradient is on both sides generally so slow that a railway could easily be laid across the Tan-la.

On the principal crest of this range as well as on other mountains in Northern Tibet, the most considerable parts, with the eternal snow, do not stretch in uninterrupted lines, but appear as islands in the general mass of mountains. Further, the snow mountains are to be found to the west of the pass of the caravan road—so far as could be seen from the mountains of Buga-magna, and in the same direction the range increases in height. So far as we were informed, Tan-la continues some 250 versts towards the west from the pass of the above-mentioned road, and comes rather suddenly to an end on extensive undulating plains which stretch to the very horizon in the west. We were informed by the natives that the same range, to the east from the pass, continues as a snowy ridge some 200 versts, and from there it continues without eternal snow still farther east, but how far we could not ascertain. I am inclined to believe that the Tan-la, not only the range itself, but also its fundamental plateau, continues to the east, although in smaller dimensions than in its western parts, all the way to Kín-cha-tsiang, that is to say, to the upper course of the Blue River that in these regions flows nearly due south. If that be the case, the Tan-la, just as the Baian-khara-ula, forms the watershed between the tributaries of the biggest rivers of Eastern Asia: Yan-tsi-tsian on the one side, and Kambodsha and a part of Salwen on the other.

Indeed, all the rivers running down on the northern slopes of Tan-la belong to the Mur-usu, that is to say the Upper Jan-tsi-tsian, which takes its origin from here. From the southern slopes of the western part of Tan-la we were informed that the great river Sacha-tsampo takes its origin and finally goes to the lake Mitik-jansa.

Prshevalskiy believes that this lake is identical with NAIN SING'S Chargut-tso. Further, Prshevalskiy was told by the natives that a river goes out of Mitik-jansa, later on falls into the lake Amdo-tsonak, and again leaves that lake under the Tibetan name Nap-chu, identical with the Khara-usu of the Mongols. This river, which lower down is called Lu-tse-tsian or, in Tibetan, Nge-kio, is the upper course of the Salwen.

If now, continues Prshevalskiy, the statements of Nain Sing are to be trusted, the source of the Salwen has to be removed far to the west of Northern Tibet, say to 53° E. long. from Pulkova, and $32\frac{1}{2}^{\circ}$ N. lat., which would mean that it should be situated even somewhat west of the source of the Yaru-tsangpo or Upper Brahmaputra. After his journey of 1879—1880, Prshevalskiy was thus of the opinion that Salwen and Brahmaputra in their upper courses »were flowing through an enormous extension of the Tibetan plateau-land, from west to east, and parallel to each other, though sharply separated through the mighty Northern Himalayan Range». He believed that an effluent from the Tengri-nor joined the river which leaves Lake Mitik-jansa, and that the same river receives all the watercourses coming down from the southern slopes of the western half of Tan-la. From the eastern part of the southern side of the same mountains and farther to the upper reaches of the Yan-tsi-tsian, may be presumed to be situated the sources of the rivers Om-chu and Barun-chu, to wit, the two rivers which join near the city of Cha-mu-to and form the river

Lan-tsan-tsian or the Tibetan Lakio. It turns to the south and has, lower down, the name of Mekong.

In that part of the range Tan-la itself which Prshevalskiy saw, the snow peaks were approximately estimated at 19—20,000 feet at least. Living rock was very rare, and in some places altogether missing. On both sides of the Tang-la, sand and argillaceous schists were found. On the northern side the glaciers go down almost to the height of the pass, and the snow-line seems to be at about 17,000 feet. On the southern side he estimates the snow and ice-line at 500 feet higher. The climate is extremely severe, and worse than the surrounding regions of Northern Tibet. Storms are general the whole year round. The cold in the winter is extreme. During the summer rain, snow and hail are constantly falling. At sunrise in the beginning of November, Prshevalskiy observed -30.0° , and in the middle of December -31.5° . Grass appears on the Tang-la to 16,000 feet. Above that height the ground consists of very extensive marshes with tussocks. Such fill also the whole southern slope. On the latter, hot mineral sources are to be found.

During 8 days Prshevalskiy ascended the northern slope of Tang-la. The animals were very weak on account of the considerable height. One had to follow a path, which, as a rule, was covered with ice. Sand or gravel had to be spread on it for the camels. The rareness of grass, the bitter cold at night and the very hard winds made the journey still more difficult. As an average, only 15 versts were covered every day. The 8th day's march took the caravan to the pass of Tang-la. To the right and left of the pass mighty mountains rise approximately to 2,000 or 3,000 feet above the pass or to about 19—20,000 feet high. Mighty glaciers, especially to the west of the camp, filled the gorges and parts of the northern slopes, continuing on them nearly to the horizontal ground. The distance from the camp to the nearest of these glaciers was only one verst. On the northern slopes some very poor grass was to be found, even up to the pass itself, the southern slope was covered with fine gravel of argillaceous schist, and living rock was not to be seen. The pass itself is so easy that it can hardly be noticed. The height was 16,700 feet. From the pass to the river San-chu at the southern side, the caravan needed 5 days. Here the height was 14,700 feet. The river just mentioned falls into the Tan-chu, or, in Mongol, Bugin-gol, which goes to Nap-chu or Khara-usu.

On a very good map in *Petermann's Mittheilungen*, 1883,¹ the »Tan-la Gebirge» is represented as stretching W. N. W.—E. S. E. at 33° N. lat. The route of Prshevalskiy crossed this range at $92^{\circ}20'$ E. long. from Greenw.²

¹ Tafel 9: *Przewalskis Reise durch die Gobiwüste und den Kwen-lun nach Tibet und zum Kuku-nor 1879 und 1880*, 1:3500000.

² A short description of Prshevalskiy's journey over the Tang-la Mountains is to be found in Н. О. Дубровинъ: *Николай Михайловичъ Пржевальскій, Біографическій Очеркъ*. С.-Петербургъ,

On his fourth journey, Prshevalskiy did not even touch any part of the Karakorum System, and we, therefore, do not need to occupy space in describing it. To Swedish readers it is available in my translation quoted above. The journey was accomplished in 1883—85 and its object appears from the title of the narrative: *From Kiakhta to the Sources of the Yellow River, Researches in the Northern Borderland of Tibet, and Journey viâ Lopnor through the Tarim basin.*¹

1890, p. 315 *et seq.* The general map of all the journeys of the great Russian traveller is of considerable value.

¹ *Отъ Кяхты на истоки Желтой Рѣки, изслѣдованіе сѣверной окраины Тибета и путь черезъ Лобъ-норъ по бассейну Тарима Н. М. Пржевальскаго. С.-Петербургъ. 1888.* A very good *résumé* of the geographical results of this journey, accompanied with an excellent map — *General N. M. Przewalskijs vierte Forschungsreise in Zentral-Asien*, von Dr. Carl Diener in Wien — is to be found in *Petermann's Mittheilungen*, 35. Band, 1889, p. 3 and 33.

CHAPTER XXXVII.

EDUARD SUESS.

In 1883 Colonel H. H. GODWIN-AUSTEN made an attempt to classify the Tibetan mountain ranges.¹ He separates the great Central Asian chain into five principal divisions, with some minor subdivisions, *vis.*: 1. The main axis or Central Asian chain, Kuenlun, 2. Trans-Himalaya, 3. Himalaya, 4. Outer or Lower Himalaya, and 5. Sub-Himalaya.²

The name Himalaya, he says, should certainly never be applied to the mountains north of the Upper Indus. »For this north-west, Trans-Indus part of the Asian chain we have the wellknown name Mustagh, so far as the head of the Gilgit valley; the Hindu Kush being an excellent term now in common use for its extension to the Afghan country.»

Godwin-Austen's Trans-Himalaya covers, as I have said before, only a small portion of my Transhimalaya. He has a feeling of great uncertainty regarding the mountains north of the Tsangpo. »In our present state of ignorance as to the composition of the chain eastward from the source of the Sutlej, we cannot attempt to lay down there any axis lines of original elevation.»

Regarding the names Mustagh and Kara-korum, Godwin-Austen expresses his views thus: »I have adopted the term Mustagh as one wellknown to the people on both sides of the range, and better known than Karakoram, applied by them to the pass of that name. The Karakoram pass also lies on an axis of elevation further to the north and intermediate between the Mustagh and Kuenlun.»

Clearer and more positively than anybody before him, Godwin-Austen fixes the position of the Mustagh axis, or, as we prefer to say, that of the Great Kara-korum. According to him it commences near Kila Panza in Wakhan, and stretches by the Baroghil and Kerambar Passes to the high peaks dominating the Hunza

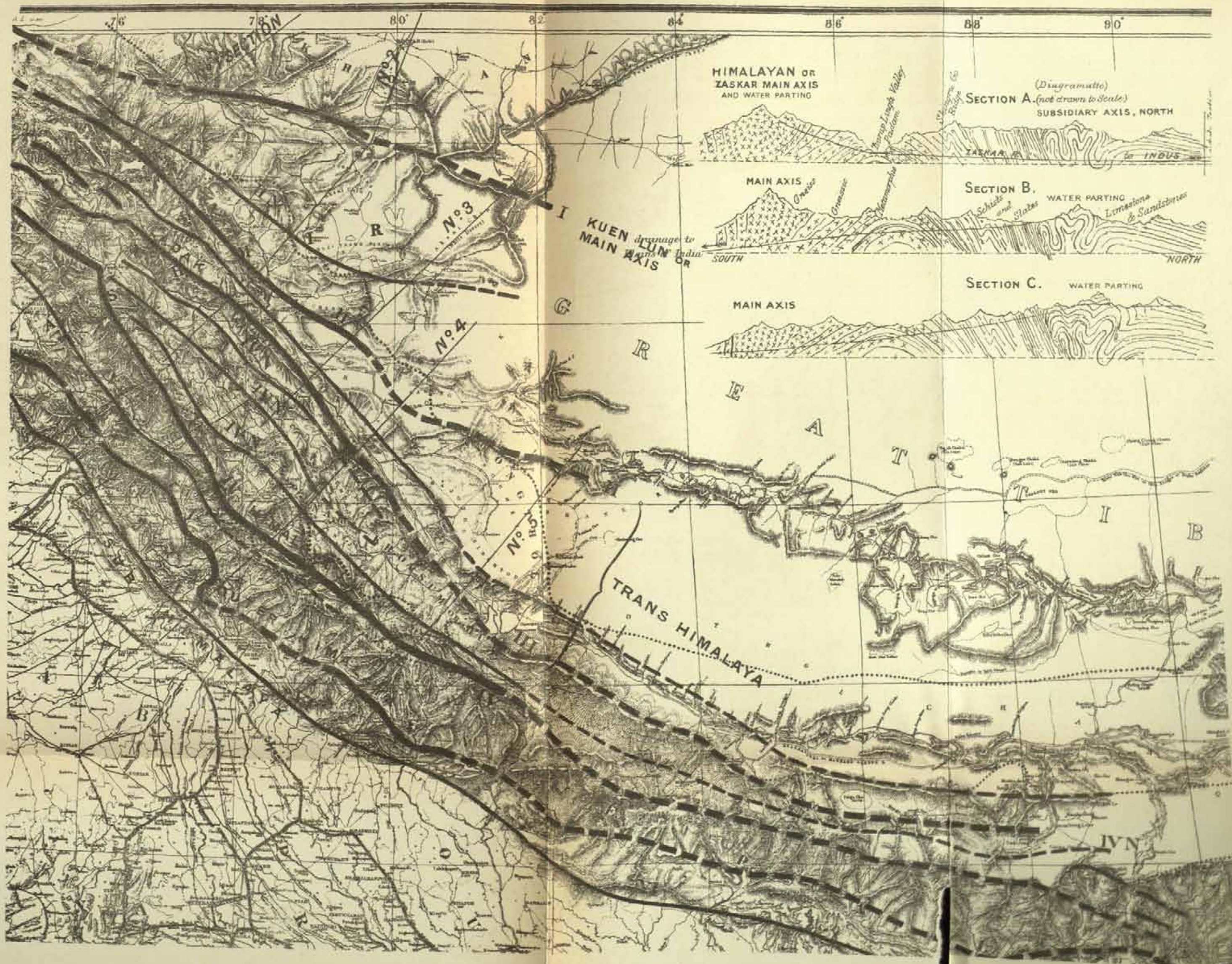
¹ *Cp.* Vol. III, p. 230 *et seq.*

² *The Central Asian chain.* *Nature*, Oct. 4, 1883, p. 552 *et seq.* The same lecture, which was read to the Geographical Section of the British Association, was also published in the *Proceedings of the Roy. Geo. Soc.* Vol. V. 1883, p. 610 *et seq.*

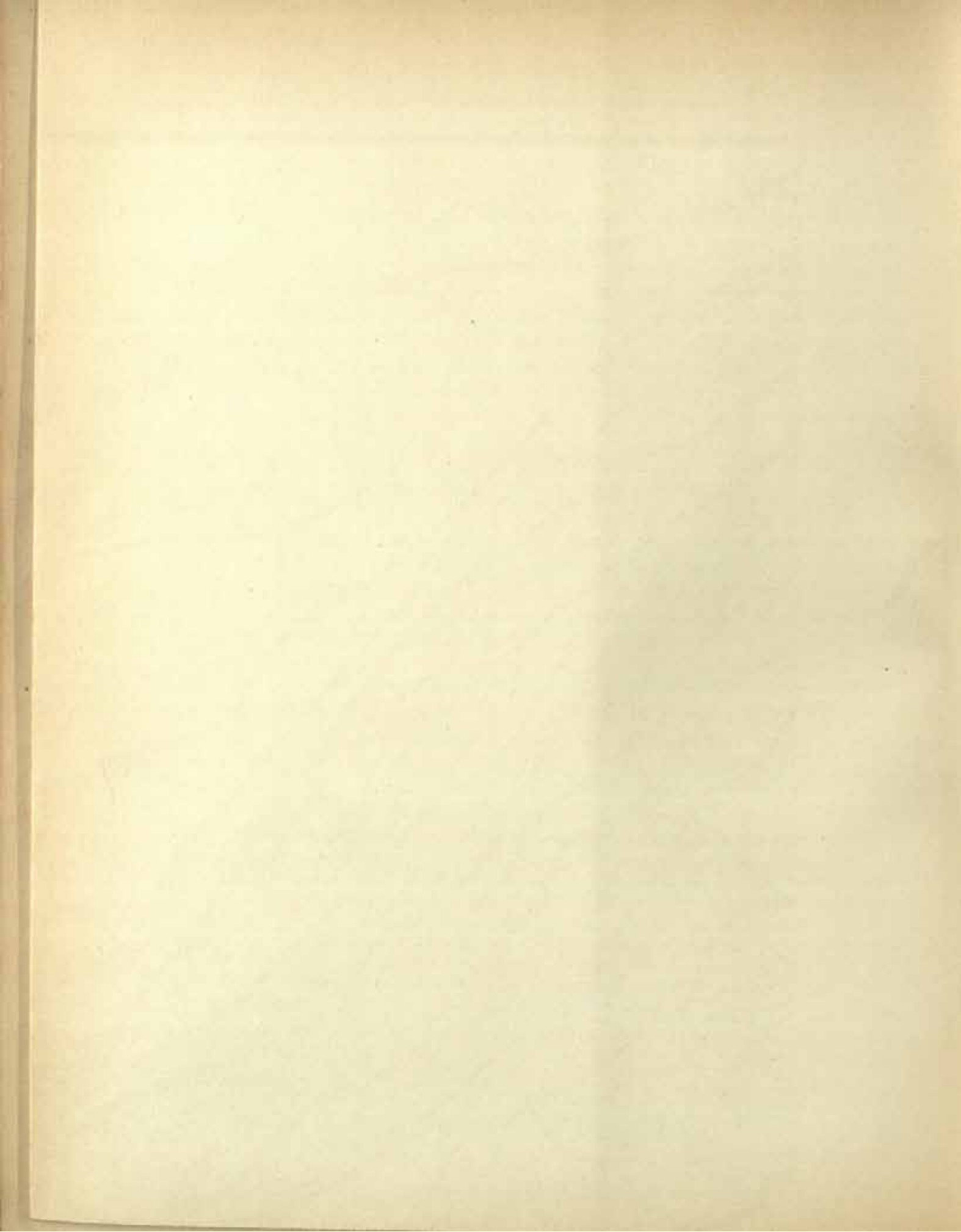
valley, to the Mustagh Pass; eastward by K₂, the peak that during some years carried his own name, farther to the high peaks north of the Shayok, K₉, K₁₀, K₁₁, and K₁₂, the Saser Pass, and thence S. E. to the Marsimik-la, and the high mass north of the Panggong Lake. »Crossing at Nyak Tso on to the high range south of the Rudok plain, where we again enter unsurveyed ground.»

Then follows this very important and certainly nearly correct theory, that only could be expressed by a man of such great intelligence and capacity as GODWIN-AUSTEN. The Mustagh Range »is probably continuous to the Aling Gangri, the old original drainage of the Shayok passing through it at the Panggong Lake, thus repeating in a similar way that of the Indus through the Ladak range near Hanlé.» S. E. of the Panggong-tso is the Rudok Plain, on the same meridian as the sources of the Indus and the Tsangpo, only a little above 14,000 feet, which in glacial and pre-glacial times drained into the Shayok, rendering that branch probably longer than that of the present Indus. Nowadays we know that the Rudok Plain is not on the same meridian as the sources of the Indus and Tsangpo, and that the Indus branch of Panggong-tso, even in glacial time, hardly could be as long as the present Singikamba. But these are only small corrections that do not in the least diminish the value of Godwin-Austen's original and clever hypothesis. He had seen the Rudok Plain with his own eyes, and for a distance of some 60 miles he saw it bounded to the south by mountains of over 21,000 feet. But he was lead astray when he surmised that this depression could have anything to do with the headwaters of the rivers that find an exit to the sea through Burma. By reason of this arrangement, as he perceived it, he could not join the Kara-korum and Gangri Range to one and the same system: »The Gang-rhi and Karakoram, or Mustagh, cannot be therefore considered as one range separating the Indus Basin from that of the northern or central plateau of Tibet.» But, on the other hand, he says of the great water-parting: »This must lie across the broad elevated plateau that extends from the Karakoram pass, having a general parallelism to the Kuenlun certainly so far as 34° N. and long. 82° E.» Though he does not dare to sketch the prolongation of the northern Kara-korum beyond 82° E. long., he has here gone much farther in the right direction than any one of his predecessors.

Regarding his Karakorum-Lingzi-Thang Range, he does not feel solid ground under his feet. West of the pass, probably the Kara-korum Pass, the country was unknown. »Eastward the line of elevation passes north of the Dipsang plain to the Compass La, and south of the Lingzi Thang plain, by the Changlung Burma La to the neighbourhood of the Kiang La, and thence still further east it may pass north of Sarthol into Garchethol.» On the whole this theory is, however, very much in accordance with facts, though in our days we are able to approach the reality somewhat nearer.



The mountain System of the Himalaya and neighbouring Ranges of India, according to Godwin-Austen, 1884.



Pl. XXVI in Vol. III represents the most important part of GODWIN-AUSTEN'S map of the Tibetan and Himalayan ranges.¹ The fine dotted line in the middle of that map indicates TRELAWNY SAUNDERS' Karakorum Gangri Range, mentioned above. Godwin-Austen says of it: »Mr. Saunders' Karakoram range eastward of the Mustakh conforms to the water-parting north of the Indus up to Rudok, where it is made to cross on to the Aling Gangrhi or my Trans-Indus extension; it is then carried south to unite with the high range north of the Manasarawar Lake, and is there continued east as a range north of, and parallel with the Sangpo. It is unnecessary to define it further, for the topography does not exist from which we can lay down such lines; the same may be said of the Kuen Lun extension east of long. 80°.»² Pl. LXVI of the present volume shows a larger part of the same map, including the regions of the Western Kara-korum, as well as the eastern continuation of the system, according to Godwin-Austen.

When, a year later, EDUARD SUESS published his great work, *Das Antlitz der Erde*,³ GODWIN-AUSTEN, DREW, STOLICZKA and LYDEKKER were his principal authorities. As RICHTHOFEN before him, Suess made an excellent physico-geographical and geological *résumé* of the Central Asian Mountains, so far as this was possible at the time. Regarding the region that is occupying our interest here, he concentrated his attention upon the relation between the Kara-korum and Kuen-lun to the Hindu-kush, Pamir and Kizil-yart. Farther east he only touched the question of the Altin-tag and Nan-shan, a region that at that time was very little known.⁴

Suess reminds us of the attempts that had been made by HUMBOLDT, RITTER, and RICHTHOFEN to penetrate the orographical structure of Central Asia and Northern China, of the journeys of PRSHEVALSKIY, and of LYDEKKER'S excellent geological map of Western Himalaya from the plain of the Indus to the glaciers of K2 in what he calls The Mustagh Range. Notwithstanding, he found our knowledge of great parts of these high alpine regions to be very scanty, and it was, therefore, necessary to start from what was really known, and to be careful in the conclusions. The following extracts contain some of Suess' most important results:

Ein keilförmig beginnendes Kalkgebirge nimmt N. vom Mustagh gegen O. so rasch an Breite zu, dass die nächstfolgende Linie älterer Felsarten, der Kuen-lun, mehr und mehr von der Richtung des Himalaya abweichend, sich der östlichen Richtung nähert. Es breitet sich ostwärts aus und bildet endlich ein weites Kalkplateau zwischen dem Himalaya und dem Kuen-lun. Diesem Kalksteingebiete gehört der oftgenannte Pass Kárákorum an.

Der Südrand des grossen Kalkgebirges liegt in Cháng-chenmo, einem Seitenthale des oberen Sháyok. An seiner Nordseite erheben sich bei Gogra graue Kalksteinwände

¹ Its title is: *The Mountain System of the Himalaya and neighbouring Ranges of India.*

² *The Mountain Systems of the Himalaya and neighbouring Ranges of India.* — *Proceedings Roy. Geogr. Soc.* Vol. VI, 1884, p. 83 *et seq.*

³ Vol. I, Leipzig 1885, p. 544 and 565 *et seq.*

⁴ Richthofen, *China*, III, p. 314.

mit Dicerocardium und Megalodon; dieser Kalk ist auf Anticlinalen von Kohlenkalk unterbrochen; sobald der nördliche Bergzug erstiegen ist, überblickt man die weite Hochfläche.

Die westlich folgenden Gebirgsgegenden hat F. Stoliczka auf drei Linien durchzogen, welche in annähernd radialer Richtung von der Tiefe des Tarymbeckens aus die Ketten queren. Die erste dieser Linien läuft von Sanju über Shahidula und den westlichsten Theil von Lingzithang nach Chángchenmo; die zweite geht von Kárgchalik über Yangi Dawan, dann gegen S. O., die vorhergehende Linie in Aktágh berührend, dann südwärts über den Kárakorampass und die Hochebene Dipsang; die dritte wendet sich gegen S. W. und führt von Yangi-hissár über Chehil Gombaz, Chichiklik und Tashkurghán gegen Ak Tásh im östlichen Theile des Pámir.

As we remember, STOLICZKA travelled on his first line from south to north, on the second from north to south, and on the third in both directions. Suess has made a summary of the results, in all three cases starting from the north.

The first two lines cross the Kwen-lun and the limestone mountains south of it, the third line crosses the same rocks, running in a somewhat changed direction. This fact convinced Stoliczka that the Kwen-lun System turns to the N. N. W., and forms the meridional mountains generally known as Kizilyárt, standing west of Kashgar and Yarkand, and in our days called the Kashgar Range.

The principal line of the Kwen-lun consists of gneiss. The surroundings of Shahidullah are also gneiss. Then follows mostly palaeozoic schists, including Suget-davan and the highlands all the way to Kizil-jilga, west of Taldat. At Shing-lung (also called Dong-lung) the limestone appears. From this point the mesozoic limestone continues down to Gogra in Chang-chenmo. Shing-lung corresponds to the continuation of the Lokzhung mountains of DREW.

Beyond Chichiklik, Stoliczka's second line reaches the schist series of the Sanju Pass. North of the Yángri Pass gneiss appears. The same schists as on the eastern line compose the pass itself, and continue to Aktágh accompanied by greenstone (Grünstein). South of Aktágh coal-limestone (Kohlenkalk) sets in. The mesozoic limestone continues to the south, and the Karakorum Pass is situated in Lias with *Belemnites*. Probably the Dapsang heights are also Lias. The limestone zone goes on to the Saser Pass, which corresponds to the running of the great Mustagh Range.

On both lines travelled by Stoliczka, gneiss and syenitic gneiss do not appear on the heights, but stretch N. from the passes Suget and Yángi.

On the third line, Stoliczka again came across the continuation of the schist zone of Sanju and Chichiklik. Near Chichiklik gneiss was reached, after which follows a zone of mica — and hornblende-schist. Then comes a second zone of gneiss and syenitic gneiss. Near Aktásh he found palaeozoic schist, and then a great limestone mountain at the upper course of the Aksu in Eastern Pamir. This limestone includes Kohlenkalk and Trias. It appears in the pass Neza-tásh and continues to the S. E.

Suess concludes:

Ein petrefactenreicher mesozoischer, wohl auch stellenweise den Kohlenkalk umfassender Zug zeigt sich im östlichen Pámir mit fast östlichem Streichen zwischen Isstyk und Aktásh, wendet sich bald gegen S. O., überschreitet den Neza-tásh, nimmt zwischen Mustágh und Kuen-lun im oberen Thale des Yárkandflusses an Breite zu, reicht endlich südwärts bis an den Saser Pass und nach Chángchenmo, umfasst in seiner Mitte Kárákoram, die Hochebene Dipsang, die Lokzhungberge, Lingzithang und alles Hochland bis an den Kuen-lun, sich wahrscheinlich ostwärts fortsetzend in den Aksai Chin, d. i. die Weisse Wüste, und gegen den Jeshil Kul.

Suess feels convinced:

dass die heute zerbrochenen und gefalteten, mesozoischen Kalkmassen, welche die einzelnen Zonen des Himalaya von Tibet bis zum Kárákoram und bis in den östlichen Pámir bilden, dereinst von einem gemeinsamen Meere abgelagert worden sind, und nun sehen wir, dass dieses Meer auch die südliche Region des heutigen Hindukush umfasste.

Of the limestone zone he says:

Das gegen Ost so rasch an Breite zunehmende Kalkgebiet Kárákoram-Lingzithang greift nun von S. O. her über Neza-tásh in den östlichen Pámir, abermals den Zusammenhang des Baues andeutend; im Norden aber krümmt sich Kuen-lun erst gegen N. W., dann gegen N. N. W., um die Ketten des Kashgargebirges mit dem mächtigen Tagharma und das Vierzig Spitzen-Gebirge zu bilden.

To this Suess adds in his Vol. III, p. 348, Leipzig 1901, especially on account of the investigations of BOGDANOVITCH:

Stoliczka hat sich getäuscht, als er glaubte, dass der Triaskalk vom Ak-tash im Pámir sich gegen S. O. bis in das petrefactenreiche Kalkgebirge des Karakorum-Gebietes fortsetzt. Es zeigt sich vielmehr, dass die Gneiss-Massen, welche Stoliczka zwischen Balgun, Tash-kurgan und Kanshubar (O. vom Ak-tash) kreuzte, sich nicht nur gegen Nord in den Mustag-ata, sondern aller Wahrscheinlichkeit nach auch gegen Süd durch den Tagdumbash-Zug zu den Hochgebirgen des Mustag fortsetzen. »Von Tagdumbash«, sagt Iwanow, »wächst das Gebirge schnell in die Höhe und fliesst zusammen mit den über die Wolken ragenden Spitzen von Kara-korum-Mustag, welche über 20,000 Fuss hoch sind.« Hiermit wird ein Bild geschaffen, welches von früheren Vorstellungen noch mehr abweicht. Mustag-ata wird zu einem Theile der Gneisskette von Baltistán, welche durch K² gegen S. O. zum See Pangong streicht . . .

Unter den Gletschern der Ketten von Baltistán selbst läuft in grosser Höhe eine Zone von verändertem Kalkstein weithin durch den Gneiss, in welchem sie eine Synclinalen oder einen nach S. W. sich öffnenden Keil zu bilden scheint.

Regarding the geological horizons, Suess has written an important article, to which here only a short reference has to be made. Stoliczka and Bogdanovitch are his principal authorities.¹

STOLICZKA was the first geologist in the Pamirs. In private letters he expressed his astonishment at finding not a plateau-land, but a series of ranges and valleys.

¹ *Beiträge zur Stratigraphie Central-Asiens auf Grund der Aufsammlungen von F. Stoliczka und K. Bogdanowitsch. . . . Denkschriften der Kaiserlichen Akademie der Wissenschaften. Math.-Naturw. Classe.* Band 61. Wien 1894, p. 431 et seq.

The fossils collected by Stoliczka were delivered to Professor SUESS by the Director of the Geological Survey of India, WILLIAM KING. When K. BOGDANOVITCH 1889—90, visited these parts, only three geologists had been there before, namely ADOLPH SCHLAGINTWEIT, HAYWARD and STOLICZKA, of whom not one returned home. The Director of the Russian Geological Committee, KARPINSKIY, sent Bogdanovitch's collections to Suess. Four specialists examined and described the specimens. The region in question corresponds fairly well with the Chinese signification Ts'ung-ling, as also western Tian-shan and Pamir are included. I quote only those places which belong to the southern parts.

1. Mittel Devon.
Stromatoporen. — Kalkstein vom Südabhange der Kette Kysyl-unguinen-tiure (Bogd. Mittl. Kuen-Lün).
2. Unter Carbon.
S. W. von Sanju (Stol. W. Kuen-Lün).
3. Moskauer Stufe (Fusulinenkalk). Tekelik-tag (Bogd. S. von Chotan.)
Jatantschi-tag (Bogd. Gebiet des Kara-kasch-Flusses).
4. Oberstes Carbon.
Aktash (Stol. Pamir).
5. Permo-Carbon?
Tiznab-Becken (Bogd. W. Kuen-lün).
6. Perm.
Woab-jilga (Stol. N. vom Karakorum-Passe).
7. Trias.
Aktash (Stol. Pamir).
8. Mittl. brauner Jura. Oberlauf des Karakash-Flusses.
(Stol. S. O. vom Karakorum-Passe).
9. Eocän.
Sanju (Stol. S. W. Rand des Tarim-Beckens).

According to Suess this series of observations proves with absolute certainty, if compared with the results gained by British geologists in the south and Russian in the north, that during a very long space of time the sea has occupied the region in question to the very centre of what nowadays is called the Asiatic high alpine region. It should only be added that Suess concludes:

dass zwar namentlich in Bezug auf die höchsten Schichten des Carbon und seine etwaige Abgrenzung gegen das Perm noch viele Fragen offen stehen, dass aber heute schon klar ersichtlich ist, dass innerhalb der unzweifelhaft carbonischen Zeit nicht nur in Europa, sondern auch in Asien grosse Veränderungen eingetreten sind, ohne dass allzu durchgreifende gleichzeitige Veränderungen in der organischen Welt bemerkbar wären.

In Vol. V of the present work, Professor ANDERS HENNIG has described the collection of specimens of rock which I brought home from my last expedition.

On the map B. attached to that volume, we find the zone of limestone, Gault-Cenoman, starting from the region of the Kara-korum Pass and Dapsang and stretching far away to the S. E. From the Chang-lung-yogma Pass to the east a belt of late

tertiary conglomerates, sandstones and schists is to be found south of the limestone zone of the Kara-korum Pass region.

At Tankse I found gneissgranite and leptite; then, in the direction of Aksai-chin: gneiss and gneissgranite and leptite to beyond Muglib, where limestone and marble appear. At Pamsal there is again gneissgranite. N. E. of Pamsal there is limestone. South of Gogra I found brown quartzitic schist. On the road to Changlung-yogma reddish sandstone. All the way to Aksai-chin I found sandstone of different varieties, sandstone schist and limestone, according to the map B., and corresponding to the limestone belt of the Kara-korum Pass.

On my way from Dapsang to Aksai-chin (Op. cit., p. 124) I likewise found limestone, schist, quartzitic sandstone, crystalline limestone, grey mica-sandstone, light, dense, cretaceous limestone, reddish brown sandstone, and so on far to the east.

The detailed geological survey of these regions still remains to be done, and certainly belongs to the most difficult and complicated problems of the earth's crust. In this connection I will only mention Dr. WILHELM GEIGER'S excellent monography of the Pamirs, in which he also makes an attempt to explain the orographical part played by the Mustagh in its relation to the Pamirs and the Hindu-Kush. He says:

Ungefähr auf dem 75. Längengrade können wir die Scharung des Hindukusch und des Mustagh ansetzen. Jener kommt von W. S. W., dieser von S. O. Von der Scharungsstelle streichen die zu den Aussenrändern beider Systeme gehörigen Ketten nach Süden und Südwesten und umschliessen die Quellthäler des Kunar und des Jassin-Flusses. — In seinem östlichsten Theile bis zum Meridian vom Kalai-Pändsch bildet der Hindukusch auf eine Strecke von 140 km den Südrand des Pamir-Hochlandes und hier, wie in seinem ganzen Verlaufe, die Wasserscheide zwischen dem Stromgebiete des Amu-darja und dem des Indus.

As is seen from his map, he reckons the Mustagh to the Himalaya System, where the name is entered south of Taghdumbasch Pamir, and »P. Kandscherab«, or the pass of Hunserab.¹

Amongst the principal authors referred to by Suess was RICHARD LYDEKKER. We cannot leave the geology of the Kara-korum without mentioning his excellent survey which partly belongs to our region.²

Lydekker refers to all his forerunners and regards Stoliczka and Drew as the most important amongst them. The area he describes he estimates at 68,000 square miles, situated to the south and south-west of the Kara-korum. The drainage area of the Shayok he defines thus: »The Sháyok flows through the districts of Chorbat and Nubra, and in its upper course receives the drainage of the Lingzhithang and Dipsang plains, and the southern side of this part of the great Mustagh or Kárá-koram range: it also drains the Chángchenmo valley, on the frontier of Chinese Tibet,

¹ Dr. Wilhelm Geiger: *Die Pamir-Gebiete. Eine geographische Monographie. Geogr. Abhandl.* Herausgegeben von Prof. Dr. Albrecht Penck. Band II. Heft I. Wien 1887, p. 161.

² *Memoirs of the Geological Survey of India.* Vol. XXII. Calcutta, MDCCCLXXXIII.

and the regions about the Pángkong lake», though Ling-si-tang, at least, hardly can be said to belong to the area of the Shayok. He states that to the north of the great Zánkár Range glaciers do not occur in any force till the Mustagh or Kara-korum Range is reached, which he regards as the watershed between the Indus and the Turkestan river systems. There is a »complete network of glaciers» on the southern side of this »stupendous mountain barrier, and some of the glaciers, as the Biafo and Braldu are only exceeded in size by the Humboldt Glacier of Greenland. Lydekker says these glaciers were »already fully described by Godwin-Austen and Drew».¹

As to the lakes he expresses the following opinion: »Along the shores of the Pángkong lake, as has already been incidentally mentioned, very similar deposits are to be met with, and also traces of old marginal beaches, indicating that the lake formerly stood at a much higher level than at present. The other large existing lakes afford very similar evidences. The waters of many of these lakes are now more or less saline, and without outlet; but there is abundant evidence to prove that they were formerly sweet, and that streams flowed from them carrying off the surplus waters.»

For the geological description of the rocks of Chang-chenmo, Ling-si-tang and Lokshung Lydekker refers to Stoliczka and Drew. This is also the case with the Kara-korum road and the Kara-korum Pass.

The work of Lydekker is accompanied by a *Geological Map of the Káshmir & Chamba Territories and Khágán*. This was no doubt the very best geological map then existing of these regions so difficult of access. Compared with the beautiful map of H. H. HAYDEN in *A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet*, Part IV, 1908, it shows that the progress of our geological knowledge of the Kara-korum Mountains has been very slow. The principal features of both these maps have been entered on Professor Anders Hennig's Karte B in Vol. V of this work.

On Lydekker's map the Kara-korum Pass, Daulet Bek-öldi and Kisil-unkur are situated in the Supra-kuling series of the Zánkár System belonging to Jura and Trias. The sharp bend of the river Shayok, just east of the Shayok village, and nearly the whole Chang-chenmo valley and the region south of it, are situated in traps and sedimentaries of the Panjál System being of Silurian and, possibly, Cambrian age. North of the Chang-chenmo and the whole way up to Ling-si-tang we find three more or less parallel belts of the same Supra-kuling series as mentioned from the region south and S. E. of the Kara-korum Pass, only interrupted along the Kograng valley and in the range of Chang-lung-yogma by two belts of the carboniferous Kuling series of the Zánkár System. The belts of different specimens of rock along the Chang-chenmo—Chang-lung road seem to correspond to similar specimens along the Kara-korum road, and to have the same N. W.—S. E. stretching as the mountain ranges.

¹ Op. cit., p. 32.

CHAPTER XXXVIII.

YOUNGHUSBAND, GROMBTCHEVSKIY, DAUVERGNE, DUNMORE, AND OTHERS.

Amongst geographical works of the period in question dealing with our regions and touching upon the Kara-korum System, I will mention a few of the most important.

EDWIN T. ATKINSON in his *Himalayan Districts of the North-Western Provinces of India*¹ has nothing new of his own, and, therefore, quotes Sir HENRY RAWLINSON. He only mentions »the Trans-Tibetan range, also called Bolor and Kárákorum». The different names he regards as only local and geographical distinctions, so far convenient and to be accepted.

A. H. KEANE, following HELLWALD, gives, in a concentrated form, a rather good definition of the Kara-korum:

From the great Pamir, focus of the continental highland systems, the Himalayas seem to break away south-eastwards in three main parallel lines — the Karakorum and Kailas or Gangri ranges, enclosing between them the valley of the Shayok, and the Himalayas proper, enclosing with the Gangri the Upper Indus valley. The Karakorum or northernmost range is known as the Tsung-ling, or Muz-dagh (Ice Mountains) to the natives, who reserve the term Karakorum to the pass of that name. Beginning at the knot of Pásht-Khar in 74° 30' E. long., it forms an eastern continuation of the Hindu-Kush, sweeping round the northern frontier of Kashmir, and stretching thence in a south-easterly direction to the neighbourhood of the sources of the Indus in Tibet. Of its eastern continuation beyond the Chang-Chenmo Pass nothing definite is known, and it is still uncertain whether it forms a connection with the Kailas range about the sources of the Indus and San-po or merges gradually with the Tibetan plateau.²

Hellwald and Keane thus identify the Kara-korum with the old Chinese Ts'ung-ling. S. E. of Chang-chenmo they regard the prolongation of the range as unknown, and cannot make out whether it is in connection with the Kailas Range or gradually

¹ Vol. I (forming Vol. X of the *Gazetteer N.-W. P.*). Allahabad 1882, p. 2.

² *Asia with ethnological appendix* by Augustus H. Keane, edited by Sir Richard Temple, London 1882 (*Stanford's Compendium of Geography and Travel*, based on Hellwald's, *Die Erde und ihre Völker*), p. 232.

disappears in and is, so to say, absorbed by the Tibetan plateau-land. Even if it was as impossible to them as to anybody else to answer this question, their thoughts went in the right direction, and they regarded a prolongation of the system as possible.

In 1881 K. E. VON UJFALVY travelled in the Kara-korum Regions. He has the following general view of the orography:¹

Im allgemeinen scheint die Terrainanschwellung gegen den Nordosten zu sich allmählich zu senken. Im Karakorumgebirge erreicht sie ihre grösste constante Höhe, zieht gegen Südosten als Himalaja, als gewaltiger Gebirgszug bis an die chinesische Grenze und stösst dort an das grosse hinterindische Alpenland. Im Nordwesten wird dieselbe Terrainanschwellung zum gewaltigen Bergstock (von dem sich der rauhe Hindukusch abzweigt), der sich an das Pamirplateau, «das Dach der Welt», lehnt. Dieses von einer mittleren Höhe von 12,000 Fuss, also niedriger als das von Deosai im Süden von Iskardo (12,500—13,000 Fuss), wird im Osten von der Kisel-Yartkette begrenzt, in welcher der Tagarma noch bis zu 20,000 Fuss Seehöhe hinaufragt.²

Ujfalvy travelled in 1881. He started from Skardo »in the morning» without telling which day and month. He crossed the Indus (where?) and ascended a pass (which?). However, from the highest point of the pass he enjoyed a beautiful view, the broad, green, luxuriant Shigar valley lay at his feet, and in the distance he saw the Boltoro Glacier, the largest in the world after the inland ice of Greenland, and in the background the Gusherbrum (26,378 feet) and Dapsang (28,265 feet), second in height on the earth. In the villages Shigar and Tshutrun he met some Pakhpus and Shakshus, who had come across the Mustagh Pass with the intention to barter in Skardo, giving gold dust and skins for stuffs. They were known to plunder on the Yarkand road across the pass.

The third day(?) Askole was reached, which is situated »nearly at the foot of the Biafo-Ganse Glacier», and from where one has a finer view of the ice-sea of the Karakorum than from any other point. To the north and east the mighty Biafo-Ganse Glacier was seen, farther eastward joined by the enormous Boltoro Glacier. Unfortunately he could not think of attempting the Mustagh Pass which, as he asserts, both in the preface and in the text, was crossed in 1760 by the Portuguese Jesuit D'ESPINHA. Ujfalvy only proceeded to the foot of the pass. He heard that it had been much used in olden times, but that travellers now avoided it on account of the snow storms and the robbers of »the upper Yarkand valley». The Nushik Pass was never used, and was regarded as one of the most difficult passages of the Kara-korum. The trade between Eastern Turkestan and the northern parts of India he found to be of much greater importance than was generally believed.

¹ A country-man of Ujfalvy, L. Berzenczey, had travelled from Yarkand by the Kara-korum Pass already in 1874, following on the heels of Forsyth. No results seem to have appeared of his journey. He was said to be the first European who ever went from Russia through Central Asia to India, which may be true unless Danibeg is to be regarded as a European.

² *Aus dem westlichen Himalaya*. Leipzig, 1884, p. 216.

On Ujfalvy's map the Hindu-kush and Kara-korum are sketched as one continuous range.

It is surprising that so late as in 1885 the Salwen could be supposed to take its origin from the far west of Tibet between Himalaya and Kara-korum. ROBERT GORDON finds this statement of Chinese sources in accordance with the information given to NAIN SING on his journey in 1873, when it was said that the river came from the extreme west of the plateau, in longitude 83° . The possibility of such an idea proves how little was known of western Tibet only 35 years ago. But the FORSYTH and other expeditions had not proceeded so far as 83° east.

In his excellent little book, LEON FEER distinguishes between three different and parallel mountain chains belonging to the Himalaya System. He remarks:

A l'extrémité occidentale, la chaîne septentrionale, qui prend le nom de Karakorum, se relie aux monts Kien-loun. Ceux-ci, se dirigeant de l'ouest à l'est, unissent en quelque sorte les deux extrémités de l'arc décrit par la chaîne septentrionale, forment la corde de cet arc, et enferment avec lui un vaste espace très peu connu, à peine exploré, que nous appelons, à tout hasard, le plateau tibétain, et qui doit être soigneusement distingué du Tibet propre, tout entier compris dans le massif himalayen.¹

Objection has been raised against such terms as Tibetan plateau, plateau-land or table-land. But, as YULE and BURNELL say: »It is a technical expression in geography, applicable to a considerable area, of which the lowest levels are at a considerable height above the sea.²

It is, however, not the altitude, but the morphology that is decisive in the choice of the term. The evenness of the great latitudinal valleys, and the insignificant difference of height between their floors and the crests of the flat ranges give us the right to use this term.

In his Geographical description of the Chinese Empire, MATUSOVSKIY has no objection against the term plateau-land.

He describes Tibet as an enormous mountainous plateau-land with an average height of 13,000 feet calculated from 260 observations made by PRSHEVALSKIY and other travellers.

This is the highest plateau-land on the earth's surface. On its southern side it is bordered by the Himalayan mountain chain, in the north by the Kwen-lun, in the east by its several ramifications, and to the west by the mountains of Kara-korum, joining Himalaya with the Kwen-luns. From this plateau-land the biggest rivers of Southern and Eastern Asia take their origin. In the N. W. it has the character of an extensive plateau, crossed by ranges of second rank, forming closed depressions with lake basins in the interior of them. . . . In the west the Tibetan plateau-land is bordered by the mountainsystem of the Kara-korum, which is a link between Kwen-lun and Himalaya and represents a very wild alpine country, where the summits of the mountains to a very great extent are covered

¹ *Le Tibet, le pays, le peuple, la religion.* Paris 1886, p. 9.

² Yule-Burnell: *Hobson-Jobson.* London 1886, p. 698.

with eternal snow; between them different passes are situated, as for instance: Kara-korum and Kara-tag, arriving at an absolute height of 18,500 and 17,700 feet.

Regarding the Gang-dis-ri Range as it was described by HODGSON and SAUNDERS, though much better known by the Chinese, he has the following passage:

In the southern part of Tibet a mountain range, called by some geographers and travellers Gang-dis-ri, stretches nearly parallel with the Himalaya. This range forms the southern boundary of the plateau-land of Katshi and borders at its eastern end upon the transverse snow group of Nin-chen-tan-la which separates the basin of the lake Tengri-nor from the tributaries of the rivers Brahmaputra and Nap-chu.¹

In 1889 Major-General DONALD MACINTYRE touches slightly upon our mountains.

He mentions an offshoot of the Kugrang called Chang Loong Koongma.

It runs up parallel to, and eight or ten miles west of, Chang Loong Yokma, leading to the desert plain of Lingzitang, averaging over 17,000 feet, across which vast elevated waste lies the route to Yarkand.

Of the world of gigantic glaciers he exclaims:

Any attempt of mine to describe the glacier scenery of the Spiti and Lahoul mountains, through which our way led for several days, would be quite inadequate to convey the slightest idea of its wild grandeur. Suffice it to say that the longest of Alpine glaciers, the Aletsch, which is some twenty miles in length, cannot be compared in size with many of those in the Himalayas, the largest of which are found in the Kara-korum range, far to the north-west of Cashmere and Ladak.²

In the same year, 1889, DUTREUIL DE RHINS published his great work on Central Asia. We do not need to enter upon his complicated deductions here.³ Among other things he »rectified» the old Chinese itinerary from Khotan to Tengri-nor and Lhasa, and brought it in accordance with the knowledge of 1889. The itinerary was unknown to D'ANVILLE, but was exactly copied by KLAPROTH. From the Wei tsang tu tche, de Rhins gives the following extract of the itinerary crossing the whole of Tibet diagonally and, therefore, also the Kara-korum System:

Quand on se dirige au nord-ouest de Lhassa, on passe par Yang ba dzian et on suit la route du Galdzan koutcha (ou mieux: pays des Khatsi) Jusqu'à la rivière du Lièvre blanc (en chinois: Pe thou ho) on a presque toujours de hautes montagnes à passer et des chemins très difficiles On passe par Nak tsang et on traverse le désert sablonneux de Gobi où s'étendent les monts Kerie la (monts Kerie qui sont couverts de neiges et de brouillards pestilentiels) Au delà du Kerie la, on arrive sur le grand chemin qui conduit à Yarkand et à la Nouvelle Frontière (Frontière nord-ouest de l'empire chinois établie sous Kianglong après la conquête de la petite Boukharie).

¹ З. Матусовскій: *Географическое Обзорение Кутайской Империи*. С.-Петербургъ, 1888. p. 322 et seq.

² *Hindu-koh: Wanderings and Wild Sport on and beyond the Himalayas*. London MDCCCLXXXIX, p. 307 and 371.

³ *L'Asie centrale (Tibet et Régions limitrophes)*. — Texte et Atlas par J. L. Dutreuil de Rhins. Paris 1889, p. 556. Cf. Vol. III, *supra*, p. 55.

On their important journey, 1885—1887, CAREY and DALGLEISH twice crossed the Kara-korum System. They started from Ladak and Tankse. At the Mangtza Lake they struck the road between Rudok and Polu, »which was surveyed by KISHEN SINGH, one of the Pundits attached to Sir D. Forsyth's mission to Turkistan». Kishen Singh proved to have done his work with admirable care and accuracy. Carey says of this road: »At various times . . . hopes have been expressed that this road, if rendered available for traffic, would form a valuable trade route, as it runs direct to India without passing through any part of the territory of the Maharaja of Kashmir. Judging from the portion of it which I saw, I do not think such an expectation can be realised.»

On their way back they crossed the Kara-korum Pass, without adding anything to previous knowledge of its surroundings. The map of the journey was carried out by Dalgleish,¹ whose itinerary was subsequently condensed and tabulated by E. DELMAR MORGAN.² Morgan speaks of the uncertainty which, in 1893, still prevailed as to the physical features of Northern Tibet. »For several hundreds of miles the courses of its principal rivers are yet unexplored, large lakes yet unvisited, and we learn from Prejevalsky and Dalgleish of grand snowy mountain ranges, where we had formerly supposed a vast undulating plateau.» This impression dated from the narrative of the Pundit A—K—,³ diversified with lakes and rivers and hill ranges and, occasionally, great mountains. »In this region the hills spring from a level which is not much less on an average than 15,000 feet or little below the highest mountain in Europe. Though highly elevated, it is not what would be called a mountainous region, for the hill ranges are usually far apart, and not 1,500 feet above the surrounding plains . . . ; occasionally, however, mountains are met with rising 5,000 to 10,000 feet above the plains, or 20,000 to 25,000 above the sea-level, and these are covered with snow all the year round. In many parts the passing traveller sees nothing but plains around him up to the sky-line.»⁴

On his memorable *Journey across Central Asia, from Manchuria and Peking to Kashmir, over the Mustagh Pass*, in 1887⁵ F. E. YOUNGHUSBAND made a very audacious dash over this difficult pass. He went up from Kok-yar to Chiragh-saldi on the Yarkand River, which was the farthest point reached by HAYWARD in

¹ *A Journey round Chinese Turkistan and along the Northern Frontier of Tibet*. By A. D. Carey. *Proceedings R. G. S.* Vol. IX, 1887, p. 731 *et seq.*

² *Journey of Carey and Dalgleish in Chinese Turkistan and Northern Tibet (Mr. Dalgleish's itinerary)*. *Supplementary Papers R. G. S.* Vol. III, London 1893, p. 3 *et seq.*

³ General WALKER, however, gets the following quite correct impression from the Pundit's narrative: It is a vast expanse of softly undulating plains.

⁴ *Four Years' Journeyings through Great Tibet, by one of the Trans-Himalayan Explorers of the survey of India*. *Proc. R. G. S.* Vol. VII, 1885, p. 65 *et seq.* and *Pet. Mitteil.*, Bd. 31, 1885, p. 6 *et seq.* Cf. also my *Scientific Results*, Vol. IV, p. 472 *et seq.*

⁵ *Proceedings Royal Geographical Society*. Vol. X, 1888, p. 485 *et seq.*

exploring the course of that river from its source downwards. Younghusband went two marches down the river to Dora. The mountains on both sides he estimated at 21,000 and 22,000 feet.

Thence he continued S. W. over the Aghil-davan from where he could see the great watershed of the Mus-tagh and an immense glacier going down to the north. He estimated the Aghil-davan at 16,000 or 17,000 feet. The appearance of the Mus-tagh he found »extremely bold and rugged as they rise in a succession of needle peaks like hundreds of Matterhorns collected together, but the Matterhorn, Mont Blanc, and all the Swiss Mountains would have been several hundred feet below me, while these mountains rose up in solemn grandeur thousands of feet above me.»

The descent goes down to the Shaksgam River, which was previously unknown to geographers. It is a tributary to the Yarkand River, but nearly equal in volume. It comes down from the main Kara-korum Range and flows N. N. W. He followed it down for a day to the point where it is joined by the Sarpo Lago stream which comes from the glaciers of the Mus-tagh Pass. A few miles up the valley he came in sight of the peak K 2, 28,250 feet high.

From Suget-jangal in the valley of the said river, he went up to the foot of the great Mus-tagh Glacier. He went up the eastern side of the glacier till it was joined by another glacier from the left.

The old Mus-tagh Pass had been out of use for 30 or 40 years on account of the accumulation of ice upon it. A new pass was found some short distance to the west; no European had crossed either of them, but GODWIN-AUSTEN, in 1861, came very near the summit of the new pass, from the south.

Younghusband forced the old Mus-tagh Pass and from its height had a most dangerous descent to the Kashmir side over nothing but ice, forming slopes and perpendicular steps, where a rope had to be used. This was probably the most difficult and dangerous achievement so far undertaken in these mountains.

The next day he came down upon the Baltoro Glacier, which had been visited by Godwin-Austen in 1862. From Askoli on the Braldo River, Younghusband made an excursion up the Punmah Glacier to the camping-ground of Skinmang, where he was stopped by a glacier »which had rolled down from the pass». He found out that in the last 4 or 5 years the mass of ice had greatly increased. Over Skardo he finally reached Rawal-pindi.

An important discovery made by Younghusband during this journey is the one he describes in the following words:

I had now discovered that between the Kuen-lun Range and the main watershed which divides the rivers of Turkestan from those flowing to India, and which is sometimes called the Mustagh Range, and sometimes the Karakorum, there lies a subsidiary range, over which leads the Aghil Pass, which I had just crossed. Hayward and the members of the Forsyth Mission, when mapping the course of the Yarkand River, had made the

tributaries on the southern side run directly down from this Mustagh or Karakorum Range but this was an error. The tributaries which they met with flow from the intermediate range, and that and the Oprang River¹ lie in between this northern branch of the Yarkand River, which they explored, and the Mustagh Mountains.²

Regarding the great watershed between Turkestan and India, Younghusband asks why it should be called Karakoram.

Karakoram means «Black gravel», and no more inappropriate name could be imagined for a range of the highest snowy peaks in the world. The name Karakoram was apparently applied to it because of a pass to the eastward, where there is black gravel, or something like it, is so called. But there is also a pass called Mustagh across the range. Mustagh means 'ice-mountain', and surely that is a far more appropriate name for this stately range of icy peaks, which form the watershed of Asia.³

Younghusband crossed the Saser-la and the Kara-korum Pass both in 1889 and 1890. As the route was well-known, he gives only a very short description of it. On his map we see, however, that he went up the Shayok from Saser-la, thus passing the snouts of the Kumdan Glaciers, which he does not mention. At any rate, the road was not closed in 1889 and 1890. During these years Younghusband enlarged, in many other directions, our knowledge of these complicated mountains. In 1889 he travelled westwards from Shahidullah. In the Sokhbulák Pass he crossed the Aktagh Range of HAYWARD and saw the snowy range of the western Kwen-lun to the east. At Chiragh-saldi the route of 1887 was struck. From Karaul he went south over the Aghil Pass, and then followed the Oprang River north of K2. On the northern side of the Mus-tagh he visited a glacier 18 miles long.

Again he was struck by the dimensions of the Mus-tagh mountains:

Their appearance, indeed, was truly magnificent as they rose up in solemn grandeur for thousands of feet above me, sublime and solitary in their glory, their sides covered with the accumulated snow of countless ages, and their valleys filled with glistening glaciers.⁴

Regarding the Oprang River he made an important discovery:

The Oprang river, which we had thus followed to its junction with what is locally known as the Raskam river, but which we usually mark on our maps as the Yarkand river, might almost be called the main branch of the river which flows to Yarkand. It is true that the more northerly branch is some 30 miles longer But the latter has quite twice the volume of water of the former, on account of its receiving the drainage of the vast glaciers in the vicinity of the Mustagh Pass.⁵

The two rivers join at Chong-jangal. One day's march from the Raskem River Younghusband met GROMBETCHEVSKIY. Over the Ili-su Pass, 14,600 feet, Younghusband entered Taghdumbash-Pamir and was struck by the great change in the

¹ *Vide* Vol. VIII.

² *The Heart of a Continent*. London 1896, p. 185.

³ *Ibidem*.

⁴ *Journey in the Pamirs and adjacent Countries*. *Proceedings Royal Geographical Society*. Vol. XIV. 1892, p. 205 *et seq.*

⁵ *Ibidem*, p. 219.

configuration of the landscape, broad open plateau-valleys instead of the deep-cut valleys he came from.

In a lecture in 1891, delivered to the Imperial Russian Geographical Society, Captain B. L. GROMBTCHESKIY related how the Council of the same society had advised him — in the case that his journey to Kafiristan should prove to be impossible on account of the unfavorable political situation — »to lead his expedition to the eastern slopes of Hindu-kush and Mustagh, explore the sources of the river Raskem-darya, the N. E. slopes of the Himalayan Range, and the boundary regions of N. W. Tibet». As the Amir Abdurrahman Khan categorically refused the Russians permission to approach Kafiristan, Grombtchevskiy had to content himself with the objects proposed by the Council. He describes his friendly meeting in the mountains with YOUNGHUSBAND. At Nia he met Colonel PIEVTSOFF.

The greatest part of his expedition falls outside of the Kara-korum regions. Amongst his principal results he mentions a 7,200 versts survey, more than 5,000 of which was in hitherto unknown country.

Grombtchevskiy does not enter upon the orographical problems. On his general map to the lecture, he uses the name Kara-korum only on the pass. The range itself he calls Mus-tagh.¹

During his expedition, Grombtchevskiy was in correspondence with the Geographical Society of St. Petersburg.

In a letter dated Shahidullah, December 10th (o. st.), 1889, Grombtchevskiy says that the Uprang River flows from the N. E. slopes of the »Himalayan Range (Mus-tagh = Ice Mountains)». ² As the source branch of the Uprang River, he regards the Sipar, in Kirgiz called Sari-kiy and Dangning-basha, and in Kanjut, Saltor. This river joins, some 60 versts from the source, the river Opar (Kirgiz), or Gos (Kanjut). Eight versts above the junction, the Sipar is formed by two branches, the eastern one, Mai-Sur, coming from the pass Balti-Davan, the western, Mus-tagh, coming from the pass Mus-tagh, which, two years earlier, had been crossed by Young-husband. Both passes opened to Baltistan. At the sources of both rivers the Himalayan Range rises to enormous heights, surrounded with very mighty glaciers. At the source of the river Opar (Saltor) he saw a peak reaching 27—28,000 feet, which obviously was the famous K 2.³

Below the junction with Sipar (Saltor) and Opar (Gos), the river Uprang is called Mus-tagh, a name which it carries some 60 versts, or to the confluence with

¹ Докладъ Капитана Б. Л. Громбчевскаго о путешествіи въ 1889—1890 гг. *Извѣстія Им. Русск. Геогр. Общ.* Томъ XXVII, 1891, p. 97 *et seq.*

² Вѣсти изъ экспедиціи Б. Л. Громбчевскаго. *Извѣстія Им. Русск. Геогр. Общ.* Томъ XXVI, 1890, p. 85 *et seq.*

³ Grombtchevskiy is not always clear. First he said the Sipar was identical with the Saltor, now that Opar and Saltor are one and the same.

the Shimshal, coming down from the Shimshal Pass, some 32 or 36 versts higher up and leading to Kanjut. Farther on the Uprang is called Shimshal for 28 versts, or to the junction with the river Uprang, at the source of which the pass Uprang is situated, leading to the sources of the river Masar (Tash-kurghan), and farther on, the Dangning-bash. Twentytwo versts lower down the Uprang falls into the Raskem-darya. He therefore estimates the length of this, the principal tributary of the Raskem-darya, at about 170 versts.

Grombtchevskiy's attempt to reach Kanjut *via* the upper Shimshal and Mus-tagh, was frustrated by the unfriendliness of the natives. From Chong-tokai he continued up the valley of the Raskem-darya, and, following the tributary Agil-davan, he crossed the pass of the same name, and again came down in the valley of Sipar or Saltor, the source of Uprang. He estimates the height of the pass at some 16,000 feet. Continuing down the Saltor to the junction with the Opar (Gos), he fixed the situation of the passes Balti-davan and Mus-tagh.

Grombtchevskiy got interesting information regarding the Kanjut robbers. He says that he has in detail explored the road on which the raids are performed, not only against the mountain tribes of Pakhpu and Chukshi, but also on the great caravan road between Yarkand and Kashmir. The Kanjutis proceed in the valley of the river Uprang, over the Shimshal Pass, continue up the river Mus-tagh (Saltor) to the pass of Agil-davan, then along the rivers Surkovat and Raskem-darya, *etc.*, or up the river Basar-dara, crossing the passes Kukalan and Takhta-korum to the mountain villages of Pakhtu, or up the river Raskem-darya to Ak-tagh, where all the roads meet, leading *via* the Kara-korum Pass to Kashmir. He says the road in the valley of the Raskem-darya is so comfortable that the Kanjutis even may use loaded camels over the Agil-davan and Shimshal, and, without any danger at all, make their retreat with their booty back to the Kanjut valley.

He thus continued to Shahidullah. From here he made an excursion along the Kara-kash-darya to the Kara-korum Pass. After a new visit to the region of Raskem-darya, he went to the sources of Kara-kash-darya and from there returned to Polu.

The journeys of Grombtchevskiy, very courageous and clever in themselves, never became of any great importance, as he postponed year after year his duty to write a detailed report of his experiences, and finally gave it up. His map was published alone, without text, in four sheets. On the right or northern side of the upper Raskem-darya, he has the Tchungkir Range, which he however calls Khrebiot Raskemskiy. He has two Khrebiot (Range) Mus-tagh, the northern with the Uprang Pass, the southern with the Mus-tagh Pass. The latter he identifies with the Gimalay or Himalaya, a rather antiquated view.

In 1889 M. DAUVERGNE travelled, from Leh, the well-known road over the Kara-korum Pass to Suget and Sanju-kurghan. Thence he struck N. W. over the

Kilian Pass, taking a route that had never been travelled by a European.¹ Besides Kilian (17,450) he crossed six other passes before reaching Kok-yar. He regards the Zarafshan as the principal source of the Yarkand River. He followed the Zarafshan to its junction with the Tung River and then went over the Kotal-i-Kandar (16,350).

Among Dauvergne's results WALKER points out 1. »That there is a second chain parallel to the great chain of the Kuen-lun, on the north, towards Kashgaria. 2. That the river of the valley of Tung is an affluent of the Zarafshan, and not a tributary of the Tagh-dum-bash River, as is shown on Russian maps.»

A few years later, 1894, General J. T. WALKER wrote an interesting *Note on the Royal Geographical Society's map of Tibet*.² In the Society's office the compilation of this map had been in progress for several years. And in the form it appears in 1894, it is said to contain all the latest information. This map has been a good help to all students of the geography of Tibet, so, for instance, to me during all my journeys in Tibet. It is also very valuable as a document showing what was known in 1894, and as a stage on the road to a complete knowledge of the country which still belongs to the future.

Amongst the material used, Walker especially mentions NAIN SING and KRISHNA, and other Trans-Himalayan operations of the native explorers attached to the Indian Survey. West of 82° Long. all details have been taken from the maps of the Indian Survey,³ and from the work of CAREY, DALGLEISH, PIEVTSOFF, PRSHEVALSKIY LITTLEDALE, BOWER, BONVALOT, ROCKHILL.

A considerable portion of the very elevated region of Chang-tang, which lies between the Kuen-lun Range and the route taken by Captain Bower, is shown as a blank. Russian maps show ranges of hills on this tract which may possibly exist, but are as yet purely conjectural. Thus a blank, with the word »unexplored» printed across it, has been adopted as at present preferable.

¹ *Notes on M. Dauvergne's Travels in Chinese Turkestan*. By Gen. J. T. Walker. *Proceedings Royal Geographical Society*. Vol. XIV. 1892, p. 779 et seq. From *Bulletin de la Société de Géographie*. Paris 1892. Vol. XIII, p. 4—40, with a map. Dr. Georg Wegener discusses the geographical results in *Petermanns Mitt.*, 38. Band, 1892, Literaturbericht, p. 157.

² *Geographical Journal*, July 1894. Vol. IV, p. 52.

³ Professor *Hermann Wagner* of Göttingen has written an excellent article on the Survey of India, 1888.

In 1800 began the systematical Survey through Major Lambton's Trigonometrical Survey.

From 1823—43 was Colonel Everest the chief; 1843—61 Sir Andrew Waugh. The next chief was General J. T. Walker as chief of the Trigonometrical Survey; Colonel Thuillier was Surveyor-General of the Topographical Survey; Thuillier had been working in the Surveys since 1836. He gave us the first official general maps of India. January 1st, 1878, the different Surveys, inclusive of the Revenue Survey were joint and were called Survey of India, and General J. T. Walker was Surveyor-General to 1885. His successor was Colonel G. F. de Prée, and (1886) Lieut. Colonel H. R. Thuillier.

After 1878 yearly reports were published.

Wagner gives a good summary of the work of the Survey, and mentions specially Col. Montgomerie who since 1862 used native explorers. — *Geographisches Jahrbuch*, herausgegeben von H. Wagner, XII. Band, Gotha 1888, p. 163 et seq.

It is curious that the ranges of the Russian maps, the existence of which was, however, very likely after Pievtsoff's expedition, were not accepted, but were replaced by the word *unexplored*, whereas this word was missing north of the Tsangpo. Only on a subsequent edition of the map, which was published with HOLDICH'S book, the eloquent word was introduced at its right place.

In this connection we may still remember a few travellers and geographers who, at the same time, or a few years after, had something to say of the Pamirs in their relation to the Kara-korum, and of the Kara-korum System itself. Thus for instance ROBERT MICHELL says of the Pamirs:

This elevated tract, embracing an area of about 37,000 square miles, links the four mountain systems of the Hindu-Kush, the Himalayas, the Kuen-Lun, and the Thian-shan; and long before the Christian era it was considered by the Chinese, as they consider it still, to be a continuation of the Kuen-Lun (Tsung-Ling or Onion mountains).¹

In an article *Die Pamirfrage* FR. IMMANUEL refers to RICHTHOFEN, FORSYTH and KOSTENKO who all had stated that the Kizil-yart (*i. e.* Kashgar Range) had a quite different structure than the rest of the Pamirs.² As a whole the Pamirs belonged to the Tian-shan System consisting of ranges stretching east—west, whereas the Kizil-yart, a meridional system of chains, was to be regarded as a continuation of the N. W. Himalaya, and more particularly the Dapsang Range. Finally, he adds that the Kizil-yart with the Tagharma group was, in 1892, very little known.

CURZON, who travelled in the Pamir in 1894, has the following view regarding the Mus-tagh Range: speaking of the Kilik Pass he says: »This portion of the Hindu Kush, or rather of that section of the main range, which, extending from this point eastwards to the Karakoram, is locally designated the Mustagh range...»³

To the discussion about the name Bolor, Belur, Balur, *etc.*, known of old and so thoroughly dealt with by Sir HENRY YULE,⁴ NEY ELIAS, in 1895, contributed some new information. MIRZA HAIDAR says:⁵

Balur is an infidel country (Káfiristán), and most of its inhabitants are mountaineers.... Baluristán is bounded on the east by the provinces of Káshgar and Yárkand; on the north by Badakhshán; on the west by Kábul and Lumghán; and on the south by the dependencies of Káshmir.... Its whole extent consists of mountains, valleys, and defiles, insomuch that one might almost say that in the whole of Baluristán, not one farsákh of level ground is to be met with.

¹ Robert Michell: *Ancient Imaus, or Bam-i-dunia and the way to Serica. The Scottish Geogr. Magazine.* Vol. VIII, 1892, p. 591.

² *Petermanns Mitteilungen.* 38. Band, 1892, p. 74.

³ *The Pamirs and the Source of the Oxus.* (Reprinted from the *Geogr. J.* for July, August, and September, 1896) London.

⁴ *Journal Roy. Geo. Soc.* 1872, p. 473 *et seq.*, and *Marco Polo.*

⁵ *The Tarikh-i-Rashidi.* N. Elias and E. D. Ross. London 1895, p. 385.

N. ELIAS says: »In one form or another the name is found in writings dating from the seventh century down to the eighteenth.« SHAW found that the Kirghiz of the Pamirs called Chitrál by the name of Pálor.

The Balur country would then include (according to Mirza Haidar) Hunza, Nagar, possibly Tash-Kurghán, Gilgit, Panyál, Yasin, Chitrál, and probably the tract now known as Kafirstan: while, also, some of the small states south of Gilgit, Yasin, etc., may have been regarded as part of Balur.

Lord DUNMORE is one of the Pamir travellers of that period. His narrative is interesting,¹ but without geographical importance.² He states that the Hindu-Kush is the continuation of the Kara-korum, not of the Himalaya. He crossed the Kara-korum Pass in July 1892. July 4th he traversed the Saser Pass, and on the 5th he says: »After crossing this plateau, we came to a spot called Moorghu, where two rivers met, and finding a spring of beautiful water, we pitched our camp there.... This is where Stoliczka died.« — Of the Kara-korum Pass he has an exciting description:

July 9th. This day saw our passage of the Mustagh, or Ice Mountains, by the Karakoram pass.... The few living Europeans who have ever been across it can be almost counted on one's fingers, and of those, but few have committed their impressions and experiences to paper for the purpose of publication. I think I have read most if not all the published accounts, of which there are I believe but three.... Prince Galitzin's account of his own experiences on the pass, as related to me by himself, would be enough to deter any one from ever making an attempt to cross it, the least of his troubles being the death of twenty-six of his ponies.

At the first camp north of the pass he writes:

Had we been fortunate enough to find the Karakoram onions that we read about, we might have given some to the ponies, but we literally never set eyes upon anything green, from the summit of the Karakorum pass to this spot, a six hours' ride.

The monument to DALGLEISH was erected by Captain BOWER: »Here fell A. Dalgleish, murdered by an Afghan.«³

In the years 1889—1894 Colonel A. DURAND was British agent at Gilgit, and had, therefore, ample opportunity to gather important information regarding the old and present roads across the high mountains.⁴

He was disturbed by the »reported existence of a pass called the Saltoro, which was said to cross the Mustagh range north-east of Skardu in Baltistan, and to give access to the Shimshal valley, and so to Hunza from the north. I knew all about Younghusband's horrible experience in crossing the Mustagh at the end of his great journey across China, and that the road he followed, formerly a well-used one to Yarkand, was completely

¹ *The Pamirs*. Vol. I. London 1893, p. 185.

² Cf. my review in *Petermanns Mitteilungen*, 1894. Litteraturbericht, p. 164, 165.

³ There is a short description of the murder of Dalgleish, March 1888, in my *Scientific Results*. Vol. IV, p. 417 and 418, note.

⁴ *The Making of a Frontier, Five Years' experiences and adventures in Gilgit, Hunza, Nagar, Chitrál, and the Eastern Hindu-Kush*. London, p. 167, 175.

blocked by glaciers. But rumours were persistent that there was a practicable pass, though its existence was always openly denied My judgement, backed by the experience of Ney Elias, was against the possibility of the existence of such a pass; still there might be one. Some of the shrewdest Kashmir officials believed in it, and they were most anxious to prove the mystery, for, in case of any further trouble with Hunza, a turning road might be invaluable.

Later exploration showed that no pass existed over the Saltoro, and that the tradition as to the existence of a road must have descended from remote times. It is pretty evident that in this portion of the Hindu-Kush the glaciers have advanced, for there seems good ground for believing that Skardu, in Buddhist times, was on a well-used high road leading to Kashgar, and that this high road has been closed by glaciers. It was a relief to find that no easy pass led to the north, for its existence would have very seriously affected the solution of the frontier problem.

In 1894 E. DELMAR MORGAN published an article on *The Mountain System of Central Asia*¹ in which he pays due tribute to HUMBOLDT and RICHTHOFEN.

In spite of the title of his paper, Delmar Morgan does not say anything of the Kara-korum, and, of course, nothing of the Transhimalaya, which does not belong to Central Asia Proper.

A very good little map is added to the paper, and was fairly well up to date in 1894. His Mustagh or Kara-korum Range is strongly marked and stretches, S. E., being in connection with the Aling Gangri, but farther east it disappears in the country Katchi. In the far east the Tang-la Range is marked, without any connection with the Kara-korum. The Nien-chen-tang-la is continued westwards along the southern shore of the Dangra-yum-tso and all the way to Manasarovar, a new form of HODGSON'S range, but no improvement of the original. As usual all the mighty systems are called Ranges and are drawn as such.

In 1896 UJFALVY returns to mention the trade across the Kara-korum Pass, though his statement is now not quite in accordance with the one quoted above:²

Actuellement, les passes entre Cachemire et Yarkand sont peu fréquentées, toutefois il est établi que la passe du Karakorum est ouverte pendant toute l'année, de plus, la communication entre l'Inde et Yarkand par cette route est devenue plus fréquente dans les dernières années; il est reconnu aussi qu'autrefois l'Hexapole était beaucoup plus peuplée qu'actuellement.

In Vol. III, p. 211, I have referred to Sir CLEMENTS MARKHAM'S excellent address to the Royal Geographical Society in 1896, and will, therefore, here only remind the reader of the cardinal points of his speech.³ In eloquent words he directs the attention of geographers to the importance of exploring the Nien-chen-tang-la. His Northern Himalaya Range, identical with the Nien-chen-tang-la, was called Kara-korum in its western part, which shows that Markham had the right grasp on the

¹ *The Scottish Geogr. Magazine*. Vol. X. 1894, p. 337 et seq.

² Charles de Ujfalvy: *Les Aryens au nord et au sud de l'Hindou-kouch*. Paris 1896, p. 69.

³ *Geograph. Journ.* July 1896. Vol. VIII, p. 1 et seq.

problem. »The Tibetan continuation of the Kara-korum, which is still almost unknown, commences at the famous central peak or knot called Kailas by the Hindus, and Gangri by the Tibetans.» He regards this gigantic system, the Kara-korum—Gangri—Nien-chen-tang-la, as the northern range of the Himalayan System, and the southern buttressing range of the great Chang or Tibetan Plateau, as the Kwen-lun is the northern buttressing range. In very clear words, and referring to all the meagre material existing, Markham thus sketched the principal features; the skeleton of the fascinating problem.

In 1891 and 1896 three important British expeditions crossed certain parts of the Western Kara-korum. Starting from Ladak and Panggong-tso Captain H. BOWER travelled, June and July 1891, north-eastwards to Lanak-la and Mangtsa-tso. He does not mention the Kara-korum, but north and south of Mangtsa-tso he has Snowy M^s on his map.¹

As to the configuration of the country Bower says:

The whole of Central and Northern Tibet, and almost the whole of Western Tibet is known as the Chang. It consists of a high tableland with hills, mostly of a rounded character; but here and there sharply defined snowy ranges are met with. The mountains have a general east and west tendency, but no defined watershed exists; rivers may be met flowing in almost any direction, and all terminate in large salt lakes. These lakes appear to have been at one time much larger than they now are, as unmistakable signs that they are drying up are to be seen.²

In 1896 Captain H. H. P. DEASY³ and Captain M. S. WELLBY⁴ also crossed the Lanak-la, without adding any new important facts to our knowledge of the Kara-korum System.

¹ *Diary of a Journey across Tibet.* London 1894.

² *A Journey across Tibet.* *Geogr. Journal*, Vol. I, 1893, p. 385 et seq.

³ *Journeys in Central Asia.* *Geogr. Journal*, Vol. XVI, 1900, p. 141 and 501. *In Tibet and Chinese Turkestan.* London 1901.

⁴ *Through unknown Tibet.* London 1898.

CHAPTER XXXIX.

BOGDANOVITCH, MEDLICOTT, BLANFORD, OLDHAM AND LÓCZY.

In this chapter I will try to give a short *résumé* of the orography of Western High Asia as explained by a few distinguished geographers and geologists some 20 and 30 years ago. If some famous Russian names are missing it is due to the fact that their geological survey and geographical exploration were carried out west or east of our regions. Still, in this connection we should not forget to mention the splendid work of the most able and sympathetic of all Russian geologists, Professor I. V. MUSHKETOFF, who, however, had no occasion to visit Western Tibet, but published the most excellent geological description of Russian Turkestan. Nor should we forget the important work of such men as POTANIN, V. A. OBRUTCHEFF, and the two brothers GRUM-GRSHIMAILO.

In 1891 K. I. BOGDANOVITCH, who was a pupil of MUSHKETOFF, delivered to the Imp. Russian Geographical Society a lecture on the orography of Kashgaria, Kwen-lun and North-western Tibet, the Geography of Eastern Turkestan, and the gold mines of Kwen-lun.¹ He found that the E. N. E. stretching mountain-system separating Kashgaria from the highlands of Tibet, in ancient times was called the Nan-shan Mountains by the Chinese. The mountain system stretching in the opposite direction, namely W. N. W. and N. N. W., and bordering Kashgaria on the west, was called Da-Tsun-lin, or Great Onion Range by the Chinese geographers, a view that is not quite correct, as we will see in Vol. VIII. However, in the Chinese Nan-shan and Da-Tsun-lin, Bogdanovitch recognizes the system that generally is called Kwen-lun.

Further he tells us that those parts of the Kwen-lun that are connected with the Pamir and more particularly the Mus-tagh-ata, as well as with the Mustagh and Kara-korum, cannot be sharply defined on their south-western sides, as these parts

¹ *Съверо-западный Тибетъ, Куэн-лунъ и Кашгарія К. И. Богдановича. Извѣстія Импер. Русск. Геогр. Общ. Томъ XXVII. 1891, p. 480 et seq.*

of the Kwen-lun are not clearly distinguished orographically from the mountains of Pamir; he says that they melt together with the ranges Mustagh and Kara-korum. The latter he calls ranges instead of systems. The British geological surveys in the Kara-korum together with his own investigations in the Western Kwen-lun convince him that, probably in the tertiary epoch, the north-western formation of folds has elevated the wide zone situated in front of the Kashgarian mountains and Western Kwen-lun (the basin of Tisnaf); in connection herewith the Kara-korum and Mus-tagh have been raised. Thus in the west he finds that the Kara-korum and Mustagh have taken part in the movements of the Kwen-lun, whilst in the east the gigantic upheaval of the regions between Tsaidam and Lhasa have taken place. At the same time the central Kwen-lun maintained a more independent position. All the folds of N. W. Tibet have thus become curved from a N. W. to a W. E. direction.

In the first chapters of his more elaborate work which forms Vol. II of the narrative of PIEVTSOFF'S expedition, he returns to the same orographical problems. Many years have passed since he published his work which is, therefore, antiquated in several points at the present day. But this fact does not in the least diminish its great value as a document of our knowledge of these parts of the world in the first years of the decade beginning in 1890.¹

He shows how the mountain ranges of Northern Tibet turning to the N. W. form the complicated upheaval of the Kwen-lun and Kara-korum. The region of lakes stretching from Panggong to Tengri-nor forms, so to say, a terrace from the highlands of Katchi, south of which the mountain block of Tibet is bounded by the entangled uplifts which to the south terminate in the Himalaya. The heights of N. W. Tibet, so far as they were explored by PIEVTSOFF'S expedition, and situated between the upper reaches of the rivers Keriya-darya and Cherchen-darya, represent a highland desert covered with detritus and gravel. Sharp ridges of insignificant relative altitude (from some ten to a thousand and more feet), half covered with the products of their own destruction represent the principal element in the relief of this country. From the ground in the valleys or intervening spaces between these ridges the heads of sharp-edged layers of old Tibetan strata crop up, as sandstone, conglomerate and breccia. These dry, barren and stony valleys and ridges together with the enormous absolute height make this land one of the most inaccessible regions on the earth's crust.

The extraordinary analogy between the northern and the southern parts of N. W. Tibet at once strikes our eyes. There, in the south as here along this unknown country — we find a series of insignificant basins without outlet. Both in the north and the south

¹ Труды Тибетской Экспедиции 1889—1890 гг. Подъ Начальствомъ М. В. Пьвцова. Часть II. Геологическія изслѣдованія въ Восточномъ Туркестанѣ. К. И. Богдановича. С.-Петербургъ 1892, p. 42 et seq.

these basins receive their poor affluents from the mountains and ranges that bound these regions, or in the north from Kwen-lun, in the south from Gang-dis-ri, *i. e.* the prolongation of the Kara-korum according to the reliable statement of the Schlagintweits.

So far as it was possible for Bogdanovitch to get a glance into that country from the north, and NAIN SING from the south, snowy mountains did not rise from its surface. This plateau-land of such enormous absolute height (the average altitude both in its northern and its southern parts, along the lakes, he estimates at 14,000 feet), occupying nearly 4° in breadth and 11° in length, has no outlet and does not possess any snow mountains. In this stony »hammada of cold Tibet one may have to dig out of the earth every drop of sweet water one needs», as Bogdanovitch says. In this part of Tibet the climate is extremely hard, it is a country avoided by men, a land where the hardy yak and Orongo-antelope do not find any grazing-grounds. »Such is, according to all that is known the mountainland of Katchi, the land of the Hor-people according to Chinese geographers.»

He again returns to the difficulty of separating those parts of the Kwen-lun that border upon the Pamir, Mustagh and Kara-korum. The different mountain systems are joined in the most complicated way and cannot be detached from one another. He approaches the question of where the western end of the Kwen-lun is to be put. The western parts of that system and of Kara-korum represent two curves which join the Mus-tagh-ata Range and eastward diverge towards the interior of Tibet. Of the further fate of the Kara-korum he has nothing to say. But in the regions of Tsaidam and Koko-nor the Kwen-lun seems to form another system of curves, stretching in the same south-east—north-west direction as in the far west, and eastward continue far into the interior of China. Between these two systems of curves the central Kwen-lun, separating Kashgaria from Tibet, represents a joining link. Genetically it is of quite another kind and age from the western and eastern wings of the system, for it belongs to the old upheaval of North-western Tibet, destroyed by the »Tibetan transgression».

According to Bogdanovitch the existence of the Samtin-kansir or Nien-chen-tang-la Range, which stretches to the N. E., makes it possible that one has to compare its geological and orographical situation with the relation between the Tibetan plateau-land, the »Russian range» and Tokus-davan. Bogdanovitch, therefore, puts the question thus: is the old E. N. E. stretching bounded only to the borderland of Tibet, or is it spread all over Tibet down to Himalaya? Under such conditions Central Kwen-lun should represent a rest of the relief of the old mass with E. N. E. stretching structure lines, which should, perhaps, prove that it stood in some relation to RICHTHOFEN'S »Sinisches System». In the first case we would have to regard Central Kwen-lun only as a local bend in the monoclinial rupture which in palæozoic time broke up the continent of Asia from E. S. E. to W. N. W., from the Malay Peninsula

to the shores of the Caspian Sea. Such curves are to be found on the same line also in Hindu Kush and Elburs.¹

Bogdanovitch travelled from Karghalik south-westward to the upper reaches of the Yarkand-darya. On his map he has the names Mustagh and Karakorum on the mighty range stretching south-eastward into the interior of Tibet.

* * *

An excellent summary of Tibetan orography is to be found in MEDLICOTT'S, BLANFORD'S and OLDHAM'S *Geology*, from which it is necessary to quote a few important passages:²

The Himálayas in a general sense are well understood to be the great system of mountains which rises to the north of the alluvial plains of upper India, and forms the southern margin of the highlands of Tibet, but the limits of the range at either end are difficult to define, for it becomes continuous with the mountain ranges between India and China on the one hand and those north of Afghánistán on the other, and though it is easy to regard these as distinct ranges, once the change of general direction is well established, the absolute continuity of each with the Himálayas, where the junction takes place, shows that the elevation of the whole was part of the same great series of movements of the earth's crust.

The geographical limits they use for the Himalayas are the lines along which the stretching of the chains of hills and of the rocks they are composed of, takes a sudden bend. »On the west this line may be taken to run through the hills west of the valley of Kashmir, from where the Kara-korum Range bends into the Hindu Kush to where the Jehlam leaves the hills.» In the east it is placed near Sadiya towards the N. E.

In Vol. III, p. 182, I have quoted the views of the Geological Survey of India, where MARKHAM'S opinion about the northern, central and southern Himalaya ranges is regarded as the most popular. This view was most beautifully illustrated on SAUNDERS' map. But in 1893 it was well known to the Geological Survey of India that the orography of the Himalayas was not so simple or well defined as it was represented on Saunders' map.

In the north-western portion of the Himalayas, where alone the geography is known with any degree of completeness, four principal ranges are commonly recognized. The most northerly and most elevated of these, which appears to bend round into the Hindu Kush at its northwesterly extremity, is the Mustagh or Karakoram range, whose culminating peak, 28,265 feet high and the second highest in the world, was formerly known as K 2, but is now often named after its discoverer Godwin-Austen.

¹ The geological results of Bogdanovitch are, in comparison with those of others, scientifically dealt with by E. SUSS in his Bd. III of *Antlitz der Erde*, Leipzig 1901, and by F. VON RICHTHOFFEN in Bd. III of his *China*, Berlin 1912.

² H. B. Medlicott, W. T. Blanford, R. D. Oldham, *A Manual of the Geology of India*. Calcutta MDCCCXCH, p. 459 *et seq.*

South of, and more or less parallel with this, comes the Ladákh range, which may be regarded as commencing near the junction of the Sháyak and Indus rivers and running thence south-eastwards along the north side of the Indus valley. This range, which has a most marked individuality both geographically and geologically, is breached by the Indus at about 150 miles from its north-westerly termination in 79° of east longitude. The range continues as far as Hanle, forming there the south, instead of the north, side of the Indus valley, but its further continuation is imperfectly known.

The Zaskar range appears to owe its existence quite as much to the accident that it forms the watershed between the Indus and Chenáb drainage, and has consequently been less denuded than the regions on the north and south, as to any special elevation it has undergone.

The outermost of the principal ranges is the Pir Panjál-Dháoladhár Range.

I have to return to the following important passage, already quoted in Vol. III:

Nothing definite can be said of the south-easterly continuation of the range. The Pir Panjál, Dháoladhár and Zaskar ranges may be regarded as coalescing and becoming continuous with the great range of snowy peaks, while the Ladákh and Karakoram ranges coalesce to continue as the range of mountains which runs north of the great longitudinal valley of the upper Indus, Sutlej, and Sanpo rivers. It may, however, well be doubted whether either of these ranges has a real continuity along the whole length of the Himálayas and it is altogether more probable that, whether we regard them structurally or according to the accidents of the existing contour of the ground, they consist of a series of comparatively short ranges overlapping each other at their extremities. The final classification of the minor ranges of the great Himálayan system of mountains must wait for a more detailed geological and geographical knowledge than is at present available.

Though it is impossible to give any definite idea of the detailed orography of the Himálayas it is possible to divide the mountains into orographical regions sufficiently distinct from each other, even if their exact boundaries are somewhat indefinite. The innermost of these is the upland of Tibet, characterized by great elevation and a dry climate with its concomitant of very extensive accumulations or detritus in the valleys.

All the principal rivers draining from the Himálayas have their sources to the north of the line of highest peaks. They cross this zone of special upheaval in deep valleys.

Oldham regards it as probable that the first effect of the commencement of the upheaval of the Himálayas was to establish a pair of longitudinal valleys along its northern face, whose drainage escaped round the extremities of the upheaval, and that in the first instance the whole of the drainage north of what is now the line of highest peaks, escaped by these rivers. As the mountains were upheaved the gradients of the rivers flowing directly to their southern margin became steeper than those of the longitudinal valleys north of the main range, the erosive power of the streams increased, and they were able to cut back through the line of maximum upheaval and rob part of the drainage which originally flowed east and west to the gorges of the Indus, Sutlej, and Sanpo.

From the maps of northern Kumáun and Garhwál and from the accounts of travellers he gathers that the slopes on the southern side of the passes are much steeper than on the northern: »the erosion of these slopes would consequently be more rapid, and as it progressed the watershed would gradually be forced northwards.»

Dealing with the desiccation of the Tibetan lakes he says:

There are no data available regarding the rate at which this is taking place, but the fact that some have dried completely up while others show but little reduction in their original size indicates that the process is still in progress and that the climate of Tibet was once moister than it now is. There appears to be but one explanation possible of this increased dryness of climate, and that is a rise of the mountains to the south, which has resulted in a more complete cutting off of the moisture from the monsoon winds.

He regards the cause of the origin of the Tibetan lakes as not quite established. Since DREW'S narrative their origin was attributed to the damming up of the main valleys by the fans of tributaries »which attained a great development during the glacial periods, when the disintegration of the rocks was more rapid than it now is, while the transporting power of the streams was not greater if so great». OLDHAM does not accept this view. »In the case of the Panggong Lake he believes that its formation is entirely due to differential movements of the surface, which raised a portion of the original river bed at a more rapid rate than the stream was able to erode and dammed back the drainage to produce the present lake.» Even in the case of the Tsomoriri in Rupshu, he does not find the fan as a sufficient explanation of the origin of the lake. He concludes: »there have certainly been irregular movements of the beds of the streams and rivers within what is, geologically speaking, a very recent period, and these irregular movements can only be regarded as evidence that the disturbance which caused the elevation of the Himálayas is still in progress».

The orographical map, *Himalaya Mountains* accompanying this work is very beautiful and probably superior to anything published at the same time.¹ Mustagh or Kara-koram is the northern-most of the Himalayan ranges. Then follow Ládak, Zanskár, and Pir Panjál-Dháolandshar ranges. From the interior of Tibet is only to be seen the results of the FORSYTH missions and the route of NAIN SING along the lakes. Between this and the Tsangpo the whole region is left blank, where my Transhimalaya is situated. Even »Ghalarung Cho» which at least had been visited by Pundits, is marked with a dotted line.

The able and erudite Hungarian geologist Professor LÓCZY LAJOS (Ludwig Lóczy), who accompanied Count BÉLA SZÉCHENYI on his famous expedition 1877—1880² to the heart of Asia, has given us a very clear and lucid summary of the

¹ July 1892.

² A personal narrative of the expedition was published by one of the members, Lieutenant GUSTAV KREITNER, in his *Im fernen Osten, Reise des Grafen Béla Széchenyi in den Jahren 1877—78—79—80*. Wien 1881. Five years later the Hungarian Society of Natural Science issued Ludwig Lóczy's book: *A kínai birodalom természeti viszonyainak és országainak leírása* (Description of the physical relations and of the countries of the Chinese Empire), Budapest 1886. I cannot read this book, which so far as I know has not been translated. Széchenyi says, it is excellent. Everybody who knows the serious and modest scholar will feel persuaded that this is no exaggeration. The illustrations are fascinating in a rare degree, and the great general map of uncommon interest. Several years after the return of the expedition the scientific results of Count Széchenyi's expedition were, in a magnificent work, given to the world.

great mountain systems of the interior of the Continent. However, Lóczy principally deals with the Kwen-lun System, as the expedition chiefly came in contact with it. He examines, so far as it was possible nearly 30 years ago, the connection between the Western, Central and Eastern Kwen-lun, and also enters upon the mountain systems interesting us in this volume.¹

Lóczy shows how RICHTHOFEN corrected the mistakes of HUMBOLDT regarding the continental extension of the Kwen-lun, and its presumed connection with the Hindu-kush, and how the same scholar, from the discoveries of STOLICZKA and the British geologists explained the tectonic relations between the Kwen-lun and the Himalaya. Later on the researches of BOGDANOVITCH modified RICHTHOFEN'S views considerably.

Lóczy points out that RICHTHOFEN, when he sketched the great lines of Asiatic orography, hardly had more exact materials at his disposition than HUMBOLDT and RITTER. His results agree very well with the experiences of the expedition of Count SZÉCHENYI, with PRSHEVALSKIY'S second and third journeys and with the wanderings of the PUNDIT A—K—.

As some of the great Chinese rivers came from a line stretching S. W.—N. E. in Eastern Tibet, Richthofen believed in the existence of a mighty protuberance in these regions, the probability of which was strengthened by HUC'S description of the mighty Tang-la.

While Richthofen regarded the Bolor Mountains of Humboldt or the Kizil-yart, as a N. W. and northern continuation of the Himalayan system,² SUESS proves that this view was wrong and that the Western Kwen-lun turns to the N. W. and N. N. W. the Kizil-yart being its continuation. He also explains how the Western Himalaya to the S. W. goes over into the Hindu-kush.

Lóczy had no dates regarding the parts of Tibet situated east of Ling-si-tang and Aksai-chin. A space of some 10° of Long., *i. e.* the interior of Tibet and the continuation of the Kwen-lun remained unknown.

The journey of BONVALOT and Prince HENRY OF ORLÉANS generally indicated a W.—E. stretching of the ranges. »In dem Reisewerke sind leider keine Angaben über Breitenbestimmungen und ebenso auch keine Routenaufnahmen enthalten, infolgedessen wir nicht in der Lage sind, über den Grad der Genauigkeit der Bonvalotschen Karte zu urteilen. . . . Das mächtige Dupleix-Gebirge scheint die W. N. W.-liche

¹ Ludwig Lóczy in *Die wissenschaftlichen Ergebnisse der Reise des Grafen Béla Széchenyi in Ost-Asien 1877—80*. Erster Band: *Die Beobachtungen während der Reise*. Dritter Abschnitt: *Geologie*. Wien 1893, p. 619 *et seq.*

² Dutreuil de Rhins is right in saying: En se servant de la carte de Klaproth pour relever les directions des principaux sommets et établir sa théorie, d'après laquelle les chaînes de l'Asie centrale seraient orientées dans le sens des parallèles et des méridiens, A. de Humboldt ne pouvait donc obtenir qu'un résultat assez incertain dont la régularité géométrique et la simplicité ne s'observent guère dans la nature. — *L'Asie Centrale*, p. 582.

Fortsetzung des Tang-la-Gebirges zu sein.» In these words Lóczy has given us one of the links in the chain Northern Kara-korum-Tang-la.

The journeys of PRSHEVALSKIY and A—K—proved that the ranges south of Tsaidam run in a direction from west to east.

Starting from 32° North. lat. and proceeding northward, Lóczy determines the following ranges:

1. Dsungulun, crossed by A—K— in the pass Kamling-la (15,050 feet).

The Samtin-Kansir, Lóczy regards as a connecting link between the Nien-chen-tang-la and the Southern Tang-la ranges. The pass Shang-shung-la between Tengri-nor and Nakchu was used by A—K—.

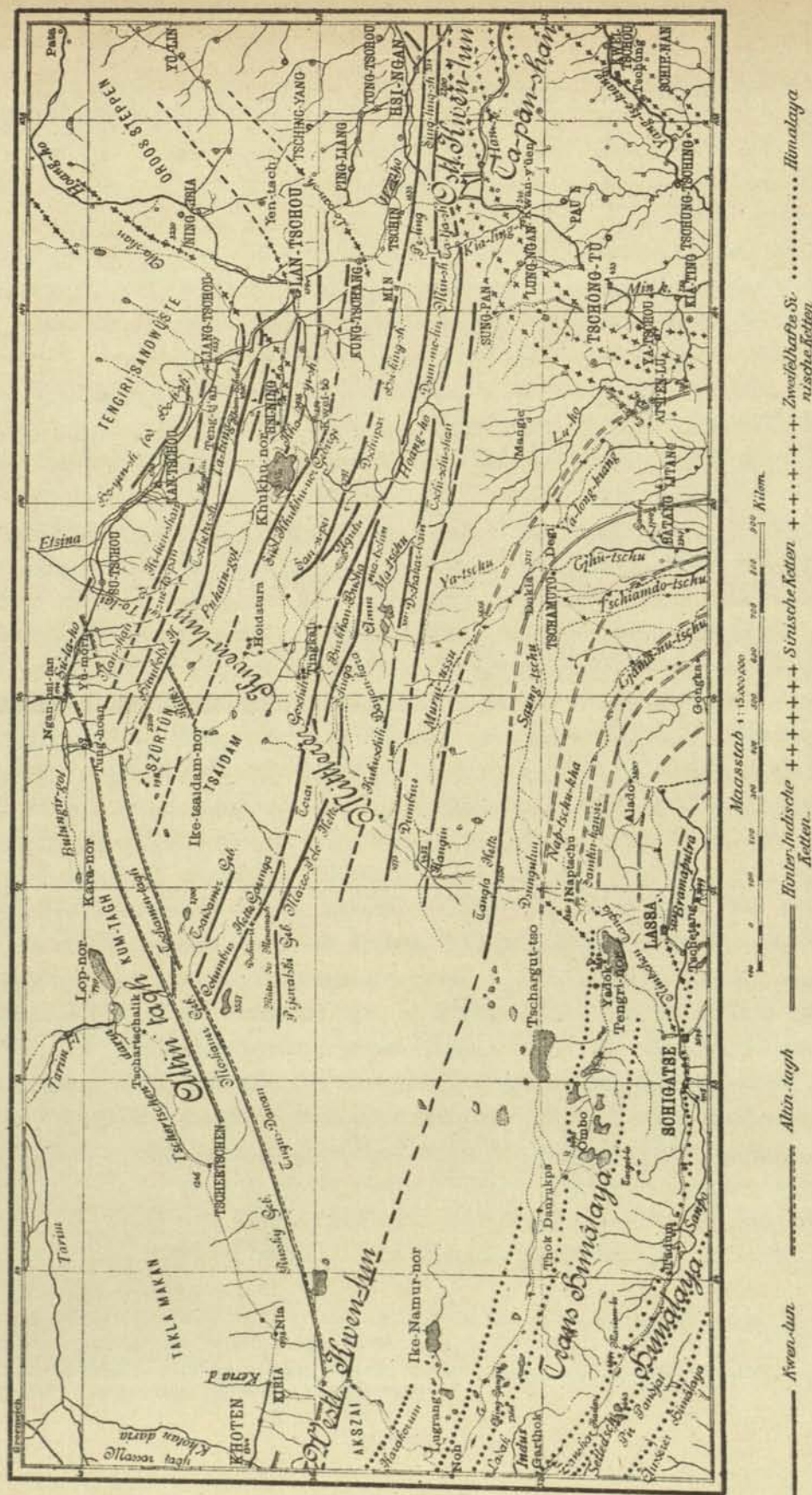
Bumsa Mount, the southern-most point reached by Prshevalskiy is 5,210 m. high and consists of coarse-grained, red gneiss containing much mica.

2. Tang-la, 5,100 m. (Pr.), 4,994 m. (A—K—) consists of clay-slate, and, at its southern side, on the banks of San-chu, of archaic schists. It stretches certainly from west to east.

Referring to Richthofen's map (Pl. XXIV in Vol. III above), and comparing it with the results of Prshevalskiy and A—K— who found that the Tang-la had a decided W.—E. stretching, Lóczy states that this orographical arrangement is in accordance with the situation and stretching of the southern-most Kwen-lun Range of Richthofen, — provided that the Western Kwen-lun continues from W. N. W. to E. S. E. through the whole interior of the unknown Tibetan highland to the sources of the Yang-tse-kiang. Lóczy finds this arrangement the most probable and natural. Therefore, still further east this principal axis of the Kwen-lun would change its direction into a meridional one in accordance with the mountain ranges of the Farther Indian Peninsula. He regards it as a possibility that the Tang-la belongs to the Kwen-lun System, particularly to the central Kwen-lun, being its southern-most range and an immediate continuation of the Western Kwen-lun. On the other hand the Tang-la together with other neighbouring ranges of Eastern Tibet could perhaps be regarded as the N. W. ends of the mountain ranges of the peninsula.

Then Lóczy continues: 3. A range with snow peaks, Kangin, Datchin-Datchin, Drshoma and Dorsi at the confluence of Murui-ussu and Tok-tonai, being parallel to the Tang-la.

4. Dungbure.
5. Koko-shili.
6. Marco Polo Range, Shuga and Barkhan Buddha.
7. Ugutu.
8. Koko-nor Ranges.
9. Cha-ji-shan.
10. Nan-shan.



Lóczy's orographic map of Tibet and Western China 1893.

Of the ranges discovered by the Pundits A—K— and NAIN SING, Lóczy has the following passage:

Auf der von Atkinson entworfenen Karte über die Reisen A—K—'s sieht man zwischen dem Tang-la-Rücken und dem Nak-tschu-kha-Flusse w-lich vom Wege nach Lassa eine von Schneegipfeln gekrönte Kette, von welcher die nach O. laufenden Flüsse ihren Ursprung nehmen. Die erwähnte Karte lässt uns auch hier mit dem Nin-tschen-tang-la parallel verlaufende Ketten vermuthen. — Die Karte Nain-Sing's stellt in der Mitte der tibetanischen Hochebene zwischen Lassa und Rudok in der Gegend des Ombo, sowie der Dangra-jum genannten heiligen Seen ähnlich verlaufende Gebirgsketten dar, die sich mit den parallelen Ketten des Himalaya kreuzen.

All the journeys undertaken across Tibet since Lóczy published his work have proved that his conclusions regarding the parallelism were quite correct.¹ In Vol. I, p. 621 of the great work of Count SZÉCHENYI'S journey, Lóczy has a most interesting sketch-map of the mountain systems of Tibet (Pl. LXVII). The volume was published in 1893, sixteen years after Richthofen's *China*, Vol. I.² Comparing these two maps with each other one becomes aware of the enormous importance of PRSHEVALSKIY'S discoveries on his journey in 1877 to Lop-nor and Altin-tagh. On Richthofen's map the hydrography of Eastern Turkestan still depends upon Chinese maps, and Lop-nor is placed 1° north of the actual lake basin. South of the old lake basin there is 2½° of sand desert before one reaches the northern-most ranges belonging to the Kwen-lun. This system is shown by Richthofen as a great number of ranges stretching W. N. W.—E. S. E. From south to north they become shorter, and their western ends run out into the desert, like side-scenes. Lóczy, on the other hand, had later discoveries at his disposal, principally PRSHEVALSKIY'S journey to Altin-tagh, which totally changed the appearance of the interior of Asia. Therefore Lóczy has cut off the western part of Richthofen's Kwen-lun System, and placed the W. S. W.—E. N. E. stretching ranges of the Altin-tagh System in front of Richthofen's Western Kwen-lun. The eastern parts of the Kwen-lun are, in general, the same on both maps.

Richthofen has made his Sinian System begin already at about 90° East of Greenwich, stretching S. W.—N. E. The Tang-la belongs to this system, as we also remember from SAUNDERS' maps. On Lóczy's map the Sinian System does not begin until 102° East of Greenwich and of Richthofen's »Sinische Ketten«, only one, Nien-chen-tang-la, is left. The rest of the space has been filled with Lóczy's »Hinter-Indische Ketten«. According to PRSHEVALSKIY'S and Pundit A—K—'s discoveries, Lóczy was able to correct the situation of the Tang-la, the stretching of which had

¹ In his vol. III, p. 217 *et seq.* Lóczy has a summary of the geological results of later journeys in Central Asia. This volume was published in 1899.

² Tafel 3 in Richthofen's *China* has the title *Karte der Gebirge und Steppen von Central-Asien* von F. von Richthofen, 1876. Cp. my Vol. III, Pl. XXIV.

never been mentioned by HUC and GABET. Lóczy has theoretically entered on his map a range joining the Western Kwen-lun with the Tang-la, and diagonally crossing Tibet from W. N. W. to E. S. E. The Kara-korum is shown as a short range, hardly reaching the Ike-Namur-nor of the Chinese maps. Farther south we recognize the long ranges at the sides of NAIN-SING'S route. In the region which I explored on my journey 1906—08 Lóczy has only one range, passing along the southern shore of Dangra-yum-tso and called by him, sixteen years before I returned home, Trans-Himálaya, a name which he, obviously, has got from GODWIN-AUSTEN and other British officers and geographers.¹ He has another range following along the northern bank of the Tsang-po. On his map the Kara-korum has no connection whatever with the Transhimalaya.

¹ I am sorry I did not notice the map of Lóczy, which would have given me a strong support when I proposed the appellation Transhimalaya to the mountains north of the Tsangpo.



Wegener: Übersicht des Kwen-lun Gebirges, 1891.

CHAPTER XL.

SOME GERMAN GEOGRAPHERS ON THE MOUNTAINS OF TIBET.

In 1891 Dr. GEORG WEGENER published his well-written monograph on the orography and geology of the Kwen-lun System. He had till then never been in Asia himself, but still his essay is a very important and complete compilation of everything known about this mountain system.¹ We cannot enter upon it here as it would take us too far, and the Kwen-lun is not a part of my object. Only one or two passages in connection with the Kara-korum should be noted.

Dr. WEGENER quotes KLAPROTH'S audacious and correct opinion regarding the continuation of the Kara-korum through the whole of Tibet, along the Tengri-nor to the Samtan-gandza and farther north-eastward to the vicinity of 32° North lat.² RICHTHOFEN'S theory regarding a great N. E. stretching mountain system was confirmed by one of MONTGOMERIE'S Pundits, who returned with a general description of the Nien-chen-tang-la, and Richthofen had just the opportunity to make use of this discovery for his map (Pl. XXIV, in my Vol. III). Richthofen's interpretation of the Pundit's discoveries was, however, as we know now, not correct. The Tang-la is not a north-eastward stretching range. It takes part, just as does the Nien-chen-tang-la, in the general west-east parallelism of the mountain ranges. And therefore the map of TR. SAUNDERS (Pl. XXI, in my Vol. III), and the map in *Andrée's Hand-atlas*, 1881, were both wrong.

I have inserted here as Pl. LXVIII Dr. WEGENER'S map: *Übersicht des Kwen-lun Gebirges*, which accompanies his monograph. It is of great value and interest as a document showing the conclusions to which a student of the material existing could arrive in 1891. We recognize the steep fall of the bordering Kwen-lun on the boundary between Tibet and the Tarim Basin as it had been investigated by PRSHEVALSKIY. Starting from this mighty range a series of parallel wings stretch

¹ *Versuch einer Orographie des Kwen-lun, Inaugural-Dissertation.* Marburg 1891.

² *Vide supra*, p. 146 et seq.

to the E. S. E., the southern one crossing RICHTHOFEN'S Tang-la in an extraordinary and unlikely way. The Nien-chen-tang-la is sketched as the south-western part of the Tang-la System. The southern-most of the crossing wings is drawn as identical with BONVALOT'S Dupleix Ms. or the Mongolian Nomkhun-ubashi-ula. This range is called Tsa-tsa Geb. just north of the Ike-Namur-nor.¹ Wegener has it from DUTREUIL DE RHINS' Feuille No. 13 *Asie Centrale (Thibet)* where Mts. Tsa-tsa are entered at about 83° East. long. and 35° North. lat. and are in direct connection with Mts. Keria on the west, both belonging to the system of Mts. Nan-chan. In his text DE RHINS says:²

Les monts Keria étant connus, nous chercherons d'abord les positions des monts Tsa tsa. Les seuls renseignements de la géographie chinoise sur cette région se rapportent précisément à la chaîne des monts Tsa tsa, Keria et Laboutsi. Les voici: Le Tsa tsa la est à 450 li (95 milles) au nord de la ville de Lodok (Rudok). Cette montagne est contiguë au Keria dabahn; à 300 li (63 milles) au nord-ouest de Lodok est le Labzi la!

The interesting part of this statement is that there exists in reality, though a little farther S. W., *viz.* 85° 20' East. long. and about 34° North. lat. a range stretching N. W.—S. E. and called Tsang-tsa-kang or Tsantsa-kang by the Tibetans, for both names are entered on my maps Pl. 4 and Pl. 5. This Tsang-tsa is probably the same as the Chinese Tsa-tsa, which has been placed too far N. W. by DE RHINS.

Wegener is quite aware of the fact that the Kara-korum is a system of the first class. He places the name Mustagh correctly only at the highest part of the system, and lets it continue to the vicinity of the point where the two uppermost Indus branches meet. The Transhimalaya he has from D'ANVILLE and KLAPROTH and it may easily be said to be in connection with the Kara-korum, where, again, Klaproth is his authority. On Wegener's map the southern ranges may therefore be said to be much nearer reality than the northern and eastern, regarding which he has made himself too much dependent upon the theories of RICHTHOFEN.

Two years later, 1893, Dr. GEORG WEGENER once more returned to the question of the great Central Tibetan Range in an article: *Die Entschleierung der unbekanntesten Teile von Tibet und die tibetische Centralkette*.³ Here he mentions the information given to Prshevalskiy regarding a S. E. continuation of the Keriya Mountains beyond 82° East. long., which seemed to be confirmed by the Chinese statement regarding the Tsa-tsa-Dawan and the mountains N. E. of Ike Namur-nor. North of the latter the road of Emperor Kien Lung runs to the E. S. E., and its situation seems to be due to the orography and morphology of the country, *i. e.* it runs parallel to the general stretching of the ranges.

¹ Op. cit., p. 57.

² *Asie Centrale*. Paris 1889, p. 573.

³ *Festschrift Ferdinand Freiherrn von Richthofen zum sechzigsten Geburtstag*. Am 5. Mai 1893. Berlin 1893, p. 385 *et seq.*

WEGENER'S map, Pl. LXVIII, was already drawn, though not yet published, when the existence of his hypothetical range seemed to be proved by the expedition of BONVALOT. The Dupleix Range, discovered by him at about 90° East. long. and about 1° north of the Tang-la was running E. S. E.—W. N. W. and was believed to be the western continuation of the latter. The high snow-range discovered N. E. of Ladak, at 35° North. lat. and 83° East. long. by BOWER and THOROLD, indicated the prolongation of the range far to the west. »Somit ist die Existenz des gewaltigen, im wesentlichen gradlinigen Kwen-lun-Zuges vom Pamir-Gebirge bis jedenfalls zum 92sten Meridian wohl als sicher anzusehen. Dieser Kettenzug ist zugleich der höchste und imposanteste des ganzen Systems.« Everything seemed indeed to be in favour of the correctness of this theory. Later exploration has, however, proved that it was wrong inasmuch as the Dupleix and Tang-la Mountains belonged not to the Kwen-lun, but to the Kara-korum System.

We now come to Dr. KARL FUTTERER who, in 1896, wrote a summary of the geology of Central Asia and China which was to be regarded as a preparation for his own journey together with Dr. HOLDERER through the Asiatic continent from west to east. He does not feel convinced that the Gaurisankar (*i. e.* Mt. Everest) and the gigantic peaks of the Kara-korum are the highest mountains of the earth. The absolute culminating peaks may be sought for in the region where the northern parts of the Farther Indian mountain systems come in contact with the old Kwen-lun Ranges.¹

He shows how SUESS has brought the great Asiatic System of folds in connection with the European mountain chains, and RICHTHOFEN has explained the relation between the geological structure and the physical as well as biological phenomena. Pamir is the nucleus in this world of mountains. Here the European systems of folds meet the Asiatic systems. Between the upper Jehlam and the latitude of Kashgar the systems of Himalaya, Kara-korum and Western Kwen-lun form a »Scharung« with the ranges from the west, *i. e.* the Hindu-kush and the Iranian folds, following along the Persian Gulf, and, after a great curve, the course of the Indus. They join in the great highlands uninterrupted by meridional depressions or any other orographical irregularities. According to SUESS the Western Kwen-lun, which continues in a N. W. direction in the Kizil-yart, is a part of the Himalayan region of folds which in a broad zone extends far beyond the Kara-korum. So far as the geological age is concerned the Kwen-lun plays the most important part amongst the Central Asian systems, for it already rose as an old folded mountain at an epoch when the ocean covered the southern parts of the actual plateau-land and its ranges. Kwen-lun is the *spina dorsalis* and the oldest mountain system of Asia.

¹ Prof. Dr. Karl Futterer: *Die allgemeinen geologischen Ergebnisse der neueren Forschungen in Zentral-Asien und China.* Ergänzungsheft No. 119 zu *Petermann's Mitteilungen.* Gotha 1896.

Futterer emphasises that in spite of the ordinary expression »Tibetan plateau-land» which is correct from a merely morphological point of view, the southern part of High Asia, from a geological point of view is a region of folds. Only the highest ridges crop up as mountain ranges. All depressions are filled with deposits and the remains of destruction, which in an enormous scale have levelled the surface. It is impossible to imagine the height of the peaks of these old folded chains which must have been enormous considering the tremendous masses of débris filling up all the intermediate depressions between the gigantic ranges and reaching to a very considerable height at the sides of the present ranges. The result of this destructive and accumulating action is the plateau-land of Tibet as we know it at present.

In spite of the geological profiles existing, Futterer regards the structure of the mountain region between the Western Kwen-lun and the Kara-korum as well as of the Western Kwen-lun itself as not quite clear. He says:

Wenn v. Richthofen angibt, dass die von S. O. nach N. W. gerichteten Ketten gegen W. N. W. und schliesslich WzN. umbiegen, und dass dadurch ein allmähliches Anschmiegen derselben an den westlichen Kwen-lun in ähnlicher Weise stattfindet, wie dies an seinem östlichen Ende seitens der sinischen Ketten geschieht, so steht damit die Auffassung von Suess nicht in Einklang, der als merkwürdige Thatsache nach Stoliczkas Berichten konstatiert, »dass der Kwen-lun selbst gegen N. N. W. abschwenkend jenes grosse Gebirge bildet, welches sich westlich über Jarkand und Kaschgar erhebt und in der Regel als Kizilyart bezeichnet wird».

FUTTERER agrees with WEGENER that the Dupleix Range may be regarded as a western continuation of the Tang-la chains. On the other hand he finds it doubtful that the Tsa-tsa-Daban and other neighbouring ranges may be the western end of the Tang-la-Dupleix System. And if the Tang-la, Dupleix and Tsa-tsa really form one and the same system, he finds it doubtful in the same degree that this system can be the tectonic continuation of the Western Kwen-lun and the Kizil-yart with their N. W.—S. E. stretching ranges. If such a range really existed, for instance somewhere south of Keriya, BOGDANOVITCH would have brought clearness to the problem. But judging from his map, no E. S. E. stretching range exists in the region south of the Western Kwen-lun. LÓCZY has only dared to indicate with a dotted line the possibility of such a connection. Already in 1904 when I wrote Vol. IV of my *Scientific Results of a Journey in Central Asia 1899—1902*, I felt sure that the view of WEGENER could not be correct, and that FUTTERER was right in his doubts. My own view appears from Pl. 69 in the volume quoted.

On his and Dr. Holderer's two years' journey through Asia, undertaken from November 1897, Futterer had no opportunity to contribute to the knowledge of the

Kara-korum as he travelled along the southern foot of the Tian-shan to Koko-nor and Shanghai. His narrative is of value as written by an intelligent man.¹

Finally it should only be mentioned that Dr. M. SCHMALER has written a long essay on the historical exploration and the different opinions regarding the structure of the mountains of Central Asia.² As it goes only to HUMBOLDT we do not need to discuss it here.

¹ *Durch Asien. Erfahrungen, Forschungen und Sammlungen.* Vol. I. Berlin 1901. Vol. II, 1905-1909 [der 1. Teil des II. Bd. 1905, der 2. Teil 1909], Vol. III, Lieferung 1 u. 3 1903, Lieferung 2 1911.

² *Die Entwicklung der Ansichten über den Gebirgsbau Zentralasiens. Inaugural-Dissertation.* Königsee 1904.

CHAPTER XLI.

DUTREUIL DE RHINS AND F. GRENARD.

The important exploration of PIEVTSOFF, together with BOGDANOVITCH, ROBOVSKIY and KOSLOFF, carried out in 1889—91, belongs to the largest extent to Eastern Turkestan and the northern regions of the Kwen-lun, and does not touch the regions of Tibet in which my last exploration falls and to which I have limited this history of Tibetan exploration. Be it sufficient to say that general Pievtsoff was a worthy successor of the great PRSHEVALSKIY.

DUTREUIL DE RHINS, on the other hand, crossed our mountain systems belonging to the Kara-korum, twice. In 1891 he had reconnoitred the district south of Pular and in August of the following year he set out across the mountains. Together with FERNAND GRENARD he reached the foot of the immense and magnificent glaciers from which the Keriya-darya takes its source. By a pass 5,550 meters high they crossed the range of the Kwen-lun which they call Ustun-tagh »The upper mountain«, which was now for the first time traversed by travellers from the north. From the other side the water does not flow to Eastern Turkestan. Great difficulties forced the travellers to turn to the S. W. in the direction of inhabited country.

To the lake Sumji-tso they followed nearly the same road which had been taken by Carey in the opposite direction. On ne voyait rien qu'une succession de collines ternes, parfois blanchies de neige, se trainant tristes et basses comme lasses d'être montées si haut.¹

August 25th they reached the Yeshil-köl. Grenard says this lake is two days from the source of Keriya-darya. From Yeshil-köl they followed a series of long valleys between mountain ranges south of which appeared the peaks of *gangris* belonging to a third range nearly parallel with the Ustun-tagh and Altyn-tagh.

Having passed the Tashlik-köl and Sumji-tso they met, September 4th, the first Tibetan. He belonged to a camp situated amongst snowy mountains. Ce lieu

¹ J. L. Dutreuil de Rhins. *Mission Scientifique dans La Haute Asie, 1890—95*. Vol. I. Paris 1897, p. 114 *et seq.* Edited by F. Grenard.

s'appelle Mang-rtzé et fait partie du district du Rou-tog province de Tsang; il est dominé par le Maouang gang-ri, énorme montagne arrondie derrière laquelle, à trois jours de marche, s'étend le lac sacré, le Ma-ouang-tso, appelé Baka-Namour par les Mongols. From this description one would suspect that the Tso-mavang or Mavang-tso, Manasarovar, were meant, but on the map the Kharol-tso is also called Maouang-tso.

From Sumji-tso they proceeded eastwards to another lake, Rga-yé Hor-ba-tso. In this region also the mountains were parallel with the Ustun-tagh. The height was generally 5,300—5,400 m. Illness and great losses in caravan animals forced the Frenchmen to return westwards to Ladak. En effet, les lacs Baka Namour et lki Namour venaient d'être explorés à notre insu, par le Capitaine Bower, qui avait constaté que Dutreuil de Rhins, par sa clairvoyance critique des documents chinois, avait placé ces lacs sur sa carte presque exactement dans leur position réelle.

Passing Sumji-tso again they followed the northern foot of a very considerable range. Puis, au lieu de prendre la route de Carey par le col de La-nag la, nous pénétrâmes dans l'épaisseur de la chaîne par le défilé de Tsa-kar Ské-dok-po, entre des collines nues et rougeâtres.

September 20th they crossed a pass 5,470 m. high and then reached Niagzu. They must have crossed the continuation of the Kara-korum somewhere in the neighbourhood of Koné-tso. Le 20 septembre, franchissant le col (Passe Koné ding) à l'altitude de 5,470¹ mètres nous entrâmes sur le territoire du maha-radjah.... Après avoir passé le Pagrim la (5,490 m.),² nous descendîmes par un interminable couloir pierreux et aride, large de cinq cents à mille mètres, entre des montagnes, hautes de six à huit cents mètres, aux flancs abrupts, dénudés, rougeâtres avec d'énormes rochers noirs. Touching the north-western end of Panggong-tso they reached Muglib and Tangse.

From Leh the French expedition returned northwards the ordinary way over the Kara-korum Pass. After having passed the Saser-la GRENARD says:

Puis, abandonnant les yaks, on remonte la gorge d'une des sources du Cha-yog (Shayok), on passe au pied même des glaciers Kitchik et Tchong Koumdân, en patageant dans l'eau. Notre guide prétendait qu'il y a cinquante ans il n'y avait pas là de passage, le glacier rejoignant les montagnes vis-à-vis montagnes très escarpées au sommet desquelles se détache un amas de rochers, semblable aux ruines d'un château fort gigantesque, que les Turcs ont baptisé le Palais d'Afrassiâb. Plus loin, la vallée s'élargit et forme un grand cirque de montagnes de neige, où la rivière Cha-yog s'étale en un lac allongé.³

Of great interest is the following annotation: Le 31 octobre, nous traversâmes le col de Karakoram, la ligne de faite de l'Oustoun tagh, showing that GRENARD

¹ On the map (Carte IX) 5,485.

² On the map (Carte IX) 5,500. Between these two there is a pass with 5,520 m.

³ Op. cit., p. 138.

has correctly understood the south-eastern continuation of the great Kara-korum towards the interior of Tibet.

By Suget-davan and Sanju-davan they returned to Eastern Turkestan.

One of the most important contributions to the solution of our problem regarding the orographical part played by the Kara-korum System has been given to the geographical world by the same FERNAND GRENARD. In his chapter *Géographie physique* and on his general map of Central Asia, Grenard has developed his views in a most clear and lucid way.¹

The Ustun-tagh-Bayan-Khara-ula is 2,400 km. in length, and 3,000 km. if the Kara-korum and Sarygh kol (Sarikol) are added, and is thus one of the most important chains of the world. He regards it as an absolute water-parting, not being pierced by a single water-course. The average height of this chain, in the section between the source of the Kara-kash River and Bonvalot's route he calculated at at least 6,000 m. The peaks have an altitude of 6,500 to 7,500 m. the highest measured by the expedition being 7,360 m. The peaks of the Kara-korum and Sarikol (= Kashgar Range) are higher, but their passes lower.

On their itinerary of 1893 the Frenchmen crossed seven parallel ranges from Ustun-tagh to the country south of Nam-tso, all stretching W.—E. The first is the one called Montagnes Rouges (30 milles broad). It was traversed October 4—7th 1893. To the west these mountains continue to the red hills situated north of Yeshil-kul. In the east they continue in the Passe Rouge and »la petite Passe de M. Bonvalot», and turning a little to the south, join the Koko-shili.

Then follows the third great range crossed in Passe du Chasseur, being the continuation of Dungbure. In the west the expedition could not find the continuation of this range on the route of 1892.

The next chain of mountains is much more considerable than the preceding. It is situated a little to the north of 34° North. latitude and was called Mt. Dutreuil de Rhins by Grenard. Its breadth is about 120 milles and it stretches to the »Col du 3 novembre», but in the chaos of its »contreforts» it is difficult to discern the principal orographical lines. However, by the help of the survey of the dominating peaks and the itinerary of LITTLEDALE he thinks it possible to solve the problem. The double chaîne of Dutreuil de Rhins diverges to the east, the northern stretching E. N. E. joining Bonvalot's Chaîne des Volcans and the Bukhamagna Range; the southern turns S. E. and joins

les monts Henri d'Orléans. Ceux-ci sont dirigés au sud-ouest et se continuent au delà du seuil des Lièvres par les monts Bonvalot qui ont une direction opposée et

¹ *Mission scientifique dans la Haute Asie 1890—95. Vol. III. Paris 1898, p. 155 et seq.* The title of the map is: *Carte de l'Asie Centrale dressée d'après les travaux des explorateurs modernes, les cartes chinoises et les renseignements d'indigènes* par F. Grenard. Dessinée par J. Hansen. 1899. 1:4,000,000.

symétrique. De cette manière l'ensemble des monts Dutreuil de Rhins, Henri d'Orléans et Bonvalot forme comme un losange de 60 milles environ, coupé de deux chaînes transversales secondaires. Les uns et les autres vont se rattacher à l'ouest aux monts du Karakoram, à l'est aux monts du Tang la. Les monts Dutreuil de Rhins sont évidemment la prolongation des monts A-rou gang-ri et Maouang gang-ri qui eux-mêmes se rattachent aux Ta-tsi gang-ri, les monts Bonvalot se rattachent aux montagnes qu'a passées M. Bower entre ses campements 26 et 28 et vont, par le massif du T'a-tchap gang-ri, rejoindre les Ta-tsi gang-ri au sud de Ko-né ts'o. A l'est de notre route les monts Dutreuil de Rhins et Henri D'Orléans se prolongent en deux chaînes voisines et parallèles, se confondant presque, dans la direction de l'E. N.-E., jusqu'aux monts Dupleix. De là une chaîne va à l'est jusqu'au confluent du Toktomai et du Tchou-mar, où vient aboutir un rameau dirigé au N. N.-O., détaché des monts du Tang la. La chaîne même des monts Dupleix se dirige d'abord à l'E. S.-E. jusqu'à la source du Tchou-mar, puis tourne au S. S.-E. et enfin de nouveau à l'E. S.-E., passe par le Tang-la, les cols Nya-ka mar-bo et Dam-tao et après les sources du Dam tchou se partage en deux chaînes qui enveloppent le bassin du Pamtchou. Celle du nord court au sud du Haut Mékong, le franchit au nord-est de Pam dzong, passe au sud de Dé-rgyé tchou, traverse le Fleuve Bleu au nord de Goun-djog dzong et se relie un peu au delà à la chaîne du sud. Celle-ci sépare dans sa première partie les bassins du Mékong, et du Salouen, est coupé par le Dza tcho qui y pratique une cluse où a passé M. Bonvalot au sud du La tchou, atteint le Fleuve Bleu probablement aux gorges Dza-ga ri et se réunissent au delà aux monts du Mi-nyag, eux-mêmes prolongement de l'Himalaya avec qui la chaîne du Tang la forme ainsi une immense ellipse très allongée . . .

Du pic trapézoïde des monts Henri d'Orléans se détache un rameau secondaire, qui va au sud du lac Tchib-Tchang ts'o, dont la vallée a été vue pour la première fois par M. Bonvalot, et se relie aux monts du Tang-la. Du seuil des Lièvres une chaîne parallèle, c'est-à-dire dirigée à l'est avec une légère inclinaison au sud, coupe les cours supérieurs du Tsa-rgya tsang-po, du Nag tchou, du Chag tchou et se relie aux puissantes montagnes du Gé-ma la, qui se détachent des monts du Tang la aux sources de la rivière Sog et filent à l'E. S.-E. pour rejoindre le prolongement de la chaîne du Tang la aux monts Ram-nong gangri.

Dans les montagnes que nous venons d'examiner, la ligne de faite est constituée par les monts Ma-ouang gangri, Dutreuil de Rhins, Dupleix et Tang la. Les plus hautes pics de montagnes qui s'élèvent au nord des lacs Ma-ouang et A-rou atteignent 6800 mètres d'après nos observations au théodolite, telle est également l'altitude approximative des monts Dutreuil de Rhins. Quant aux monts Dupleix, la hauteur de 8000 mètres que leur attribue M. Bonvalot est certainement exagérée de même que celle de 6000 qu'il donne au col par où il a franchi cette chaîne . . . Dans les environs du Dam-tas la et du Nya-ka mar-bo, les plus hauts pics dépassent de peu 6000 mètres. Quant aux cols, le Hor-ba-Ma-ouang la mesure, d'après M. Bower, 5648 mètres, le col Dutreuil de Rhins 5630, le col Littledale 5600, le col Bonvalot à peu près autant, le Tang la occidental 5200 d'après Prjévalsky, le Dam-tao la 5041 et le Nya-ka mar-bo 5000 . . .

La chaîne secondaire du Boukha Mangna qui se détache à l'est des monts Dupleix est moins élevée: le col traversé par M. Bonvalot aurait 250 mètres de moins que le col Dupleix et celui de Boukha Mangna aurait, selon Prjévalsky, 131 mètres de moins que le Tang la.

Les montagnes dont font partie les monts Bonvalot et Henri d'Orléans ne sont pas beaucoup moins élevées que la ligne de faite du Tang-la et de ses prolongements. Le plus

haut des monts Bonvalot mesure 6545 mètres et le pic en forme de table des monts Henri d'Orléans ne semble pas être moins élevé. Le seuil de la rivière des Lièvres n'est, il est vrai, qu'à 4631 mètres d'altitude; mais à l'ouest, le col Bower a 5384 mètres, à l'est on a sur les routes de M. Littledale et de M. Bonvalot des passes de près de 5500 mètres, enfin le Gé-ma la, franchi par nous, mesure 5160 mètres.

In a note Grenard adds:

A l'ouest des monts Ta-tsi gang-ri nous avons traversé une très puissante chaîne, semée de glaciers, dont nous n'avons point parlé dans ce tableau général. C'est la chaîne du Gyou la (5720 m.), continuation de celle du Sa-ser la. Elle est parallèle à la chaîne des Ta-tsi gang-ri et se dirige au S.-O. depuis le mont Mouz-tagh, où elle se relie aux monts Karakoram, jusqu'aux bords du Pang-kong. On peut la suivre au delà de ce lac par la chaîne qui borde la rive droite du haut Indus et de la rivière de Gar-t'og jusqu'au lac Manasarovar. De même la chaîne de Lé, au lieu d'être regardée comme une suite de la chaîne des grands lacs, peut-être considérée comme se prolongeant au S.-E. parallèlement à la précédente, le long de la rive gauche des rivières susdites.

Le col Kar-dong est toujours couvert de neige sur son flanc noir depuis 5200 mètres, les cols Karakoram et Souget depuis 5100, mais en beaucoup moindre abondance.

In this passage which I have quoted in full on account of its importance GRECARD explains his conviction that the Kara-korum fold may be traced through the whole of Tibet, and that it is in uninterrupted connection with the Tang-la. The ranges Dutreuil de Rhins¹ and Henri d'Orléans continue close to one another eastward to the Dupleix Range. The mountains Dutreuil de Rhins GRECARD regards as a prolongation of Aru-gangri and Mavang-gangri. The two ranges with the names of the two famous French explorers join the Kara-korum to the west and the Tang-la to the east. The Kara-korum, Mavang-gangri, Dutreuil de Rhins, Dupleix and Tang-la

¹ In his popular narrative *Le Tibet, le pays et les habitants*, Paris 1904, p. 45, on the expedition of Dutreuil de Rhins, Fernand Grenard describes the passage over the mighty mountain range to which he gave the name of the Chief of the expedition. It was accomplished in the middle of Octobre 1893.

Le 14 octobre, nous commençâmes la traversée d'une autre puissante chaîne de montagnes presque égale à l'Arka tagh. Sur ses pentes septentrionales, quelques oignons sauvages croissaient jusqu'à près de 5300 mètres d'altitude; au delà la stérilité était absolue. . . . Le 14, nous franchîmes un premier col, puis un second plus élevé qui nous conduisit au cœur même des montagnes de neige. Le 15, nous reprîmes notre marche pour traverser la crête méridionale, la plus haute, comme toujours (5630). (On the map the height is given as 5630. But in the scientific results of the expedition, I, p. 204, it is 5500 m. Vol. III, p. 173 it is 5630, which is correct.) — J'ai donné à ce passage le nom de Passe Dutreuil de Rhins. — Nos hommes, qu'effrayait ce désert infini de montagnes, étaient pris d'un désir ardent d'en sortir, de voir autre chose. A mesure qu'ils allaient, on les sentait plus impatients de savoir ce qui apparaîtrait derrière cette crête suprême, qui semblait fuir sans cesse devant eux, car, chaque sommet gravi, un autre se dressait en avant. Pourtant, à force d'avancer, voilà bien enfin la dernière montée. . . . Au loin, jusqu'à lieu des journées de marche, la vue de toutes parts s'étendait sur un désert morne de vallées et de collines arides, borné de glaciers et de monts gigantesques, dont la sérénité imperturbable ressemblait à de l'insolence. Nous-mêmes nous faillîmes avoir une déception: la montagne était à pic, un véritable abîme s'ouvrait sous nos pieds, rendant la vallée inaccessible. Ayant erré quelque temps sur la crête, nous trouvâmes une pente praticable quoique encore très abrupte et hérissée de cailloux pointus et tranchants. Ce ne fut qu'avec de grandes peines que nous réussîmes à mener nos chameaux jusqu'en bas. — In the scientific results of the expedition the above description is exactly the same as here.



The ranges of the interior of Tibet, according to F. Grenard, 1899.

are practically one and the same range, or rather system of ranges through the whole of Tibet. I feel convinced that this theory of Grenard is quite correct, and during my researches I have arrived at the same result. In several details our orographical maps are, of course, different. But the great features are nearly the same.

In his chapter on the physical geography of Tibet, Grenard has discussed and classified all the ranges of Tibet, as well as the hydrographical systems. In this connection I have only quoted the passages regarding the Kara-korum System. Since the days of KLAPROTH nobody has approached the correct solution of the Kara-korum Problem so near as GRENARD. In many details his map will have to be altered in the future. So for instance there is no meridional range between the Lake of Aksai-chin and Lake Lighten, nor does the Ustun-tagh stretch from E. N. E. to W. S. W. between the same lakes, for, as we have seen in Vol. IV. the intermediate space between them is nearly as flat as a floor.

Instead of following Grenard's excellent summary of the whole system of folds in Tibet, I refer the reader to his map, the most interesting part of which is reproduced here as Pl. LXIX.

CHAPTER XLII.

A—K—, BONVALOT, ROCKHILL, AND OTHER TRAVELLERS IN THE EAST.

A few words have to be said of the travellers who in the latter half and towards the end of the 19th century crossed the eastern continuation of the Northern Kara-korum, *i. e.* the Tang-la System, famous ever since HUC'S days.

In Vol. III I have already mentioned the celebrated Pundit A—K—, or KRISHNA and his journey 1878—1882 when he crossed the eastern part of the Nien-chen-tang-la in the Shang-shung Pass. The highest pass he crossed was on the Tang-la Range or Dang-la as he calls it, being 16,400 feet high and constituting the water-parting between the upper basins of the Yang-tse-kiang and the Mekong.¹ On the map the Tang-la Range runs, just south of 33° North. lat., nearly due eastward to 97° East long. or the vicinity of the Di-chu River. This is just south of Kegudo where Dutreuil de Rhins was murdered some 13 years later.

In August 1881 the travellers left Sachu, and retracing their footsteps crossed the continuation of the Kuen Lun range by a more easterly route than that they had previously taken, and found themselves on the Tibetan plateau, close by the sources of the Hoang-ho, which were afterwards visited by Prshevalsky on his last journey in 1884-85. They crossed the Ma-chu, as the upper waters of the Hoang Ho are here called, and travelled southwards by a lonely, uninhabited route leading across the Di-chu or Upper Yang-tse-kiang to Kegudo, which is a place of trade.²

A—K—S journey is one of the most brilliant ever undertaken in these regions. However, the geographical facts he brought back were meager and not always reliable.

¹ *Four years' Journeyings through Great Tibet, by one of the Trans-Himalayan Explorers of the Survey of India.* By General J. T. Walker. *Proceedings Roy. Geogr. Soc.* Vol. VII, 1885, p. 65 *et seq.*, illustrated by a good map. — A key-map to the map of A—K—s journey is to be found in *Gen. Rep. on the Oper. of the Survey of India Departement 1882—83.* Prepared under the direction of Colonel G. C. De Pree. Calcutta 1884, p. 40.

² *A memoir on the Indian Surveys, 1875—1890;* by Charles E. D. Black. London 1891, p. 154.

On his journey in 1889—1890 GABRIEL BONVALOT, accompanied by Prince HENRI D'ORLÉANS, discovered a range of mountains which he called M^{ts} Duplex, situated at 34° N. lat.¹ This range seems no doubt to be the western or W. N. W. continuation of the Tang-la, which earlier, though 2½° farther east, had been crossed by HUC, A—K—, and PRSHEVALSKIY, and which, nearly at the same place, or at about 90° East long., two years later would again be crossed by ROCKHILL. Between BONVALOT and PRSHEVALSKIY the intermediate space may, without any hesitation, be said to be filled up by very considerable mountains, all belonging to the same system of Tang-la. As to its eastern prolongation it continues to the S. E. and south. To the west it continues in the high mountain ranges, which Bonvalot discovered. He does not say very much of geographical value regarding this important discovery on his plucky dash across Tibet.

Le 14 janvier, nous campons dans le bas de la passe qui nous permettra de franchir une énorme chaîne à laquelle nous donnons un des plus beaux noms de France: nous l'appelons chaîne Duplex... Nous sommes plus haut que jamais. A côté de notre camp se dressent des pics de glace d'au moins 8000 mètres, et depuis trois jours nous louvoyons dans un fouillis où nous cherchons le sentier qui nous mènera de l'autre côté de la chaîne. Mais la série de pics, la brume qui les cache juste assez pour les rendre plus effrayants encore, l'impossibilité à peu près complète de se mouvoir à une altitude d'environ 6000 mètres, ce sont là autant de causes de découragement.... Ces montagnes apparaissant chaque jour plus nombreuses éteignent le courage de nos gens.... Les hauts plateaux ont l'air de n'avoir pas de fin.... Le 15, nous franchissons la passe, d'environ 6000 mètres, en suivant une pente douce. A l'ouest, nous voyons descendre des glaciers vers une large vallée que nous suivrons et où la glace sera notre chemin. Des pics blancs se perdent dans la brume: nous estimons leur altitude à 8000 mètres au moins. Dans toute cette région, les petits lacs, les étangs sont nombreux.

The 16th of January they found that a large river took its origin from the mountains of Duplex. »It is possible«, he says, »that we are at the sources of the Yang-tsé-kiang«.

The following absolute heights on Bonvalot's map will give an idea of the profile across this part of the Tang-la: Lac Montcalm, in the north, 4,960 m., and then: 5,200, 5,500, 5,760 (Pass), 5,450, 5,700, 6000 (Pass Duplex), 5,480, and finally, 5,260, at a little marsh in a large valley south of the Tang-la.

The pure geographical results of Bonvalot's expedition were not very great. The map is insufficient and unreliable. One misses in his book a real physico-geographical description of the interesting countries he has passed, and as a rule he does not tell us very much about the stretching of the ranges he has crossed.² Still the journey had a great importance as a pioneer work, as it proved the possibility of crossing High Tibet in winter.

¹ Gabriel Bonvalot, *De Paris au Tonkin à travers le Tibet inconnu*. Paris 1892, p. 213.

² Cp. Dr. Georg Wegener: *Petermanns Mitt.*, 1892, Bd. 38, p. 165.

The journey of Miss TAYLOR who crossed the Hwang-ho in the end of September 1892, was stopped at Najuca and reached Tatsienlu April 12th 1893, as well as the expedition of Roborovski and Kosloff 1893, are outside of our regions.¹

WILLIAM WOODVILLE ROCKHILL is one of the most serious and erudite explorers that ever have visited Tibet. His journeys, however, only very slightly come into contact with our regions, *i. e.* with the eastern continuation of the Kara-korum.

Of the »great mountain chain which marks the border of the high Tibetan table-land», with the passes of Nomoran and Hato and the road to the Burhan bota and Lhasa, Rockhill remarks:

On our maps this range figures under a variety of names, none of which are known in the country. The name Kuen-lun is given it generally, but early Chinese geographers applied this one to another range, in all probability the Koko-nor or Nan-shan. Prjevalsky calls it Burh'an Buddha range and on other maps it is called Angirtakshia, both incorrect expressions. Burhan Buddha is properly Burhan bota (as pointed out by Huc, II, 215), and means 'The Buddha's kettle'. Angirtakshia is the name of a pass, as is Nomoran, Hato, Burhan bota. Prjevalsky, who gave names to so many peaks, lakes, and localities which had well-known native ones, missed a fine chance here. The range has no name. Why not give it his, as he was the first scientific European traveller who crossed it? or that of the much maligned Huc, if it must have one?²

On his second journey³ 1891—1892, Rockhill saw a good deal of the Tang-la.

Marching in the valley of a little feeder of the Murus, PRSHEVALSKIY'S Murusu, he makes the observation that limestone is the principal rock in the hills to the south, and that, judging from the gravel and débris washed down from the northern hills, sandstone, mostly reddish, predominates there.

June 25th, camping at a height of 16,850 feet, he says: »We have also reached the west end of the Dang la range.» The ground was covered with gravel and grassgrown hummocks. »From here the western end of the Dang la seems to be a line of low black hills, over which our route must lay.» Both limestone and sandstone were now to be found, though the rugged outlines of Dang-la indicated an eruptive formation.

Crossing the foothills of the Dang-la Rockhill continued to the W. S. W. by West. »To our west, some twenty miles away, rose a short range of mountains with its central portion covered with snow.» There was a little lake into which the watercourses of the neighbourhood emptied. Here was at last »the Central plateau of North Tibet».

¹ The latter is described in an extract by von Krahmer in *Petermanns Mitt.*, 41. Band, 1895 p. 6, 33, 62 and 109 *et seq.*

² William Woodville Rockhill: *The Land of the Lamas. Notes of a Journey through China, Mongolia and Tibet.* London 1891, p. 139.

³ William Woodville Rockhill: *Diary of a Journey through Mongolia and Tibet in 1891 and 1892.* Washington 1894, p. 218 *et seq.*

Away to the southwest there is a low ridge running westward and connecting the Dang la with another range of hills, but we have, as we hoped, turned the great mountains. The snow peaks at whose base we are now camped are truly the 'Head of the Dang la' (Dang la tolh' a). They rise apparently 2000 feet above the snow line, and at least for 1000 above where we are camped (17,000 feet above sea level), they are without snow, we must conclude that the line of perpetual snow in this region is at very nearly 18,000 feet above the level of the sea.

Rockhill regards the Tang-la as the northern political boundary of Tibet. From there to Tsaidam is no-man's land, usually called Chang t'ang or »Northern Plain».

June 27th he continued W. S. W. along the foothills of the Dang-la. Fine gravel, and very little grass. »Our view of the Dang-la and its snow fields is absolutely unobstructed. I cannot decide whether there are any glaciers. I am inclined to think there are none.» The rocks he saw were all limestone and granite. »The whole country, as far as I can see, is covered with hills, between which are pools and lakelets receiving all the drainage.»

June 28th he says:

We are now well to the west of the Dang la, which stretches out in a southeast by south direction, as far as we can see. Some twenty miles south of us we can distinguish a short range of black hills, and nearer to us in the same quarter another short range, running southeast and northwest, from which issue several streams emptying a mile below our camp into the Kétén gol. No mountain range of any importance beside the Dang la can be seen, but innumerable little blocks of hills intersect the country in every direction. The soil is very barren; where we have camped there is a little grass, but elsewhere there is only sand and gravel.

From the camp of July 1st Rockhill took the last view of »the western extremity of the Dang la».

From Rockhill's map¹ his »Dang la, Snowy Range», does not give us the impression of a continuous range, but rather of detached groups and masses, the biggest of which, with several snow-peaks, is situated to the S. E. of his route. He does not enter any western continuation of the range. Where his route begins to take a nearly easterly direction it is bordered to the north by another part of the Dang la, carrying two Snow peaks. Between this part of the range and the above-mentioned group all seems to be mountains, forming one range. This is the part of the system which, according to his text, Rockhill turned around in the west.

In 1894 Rockhill delivered a lecture in London on the same journey. There he again gives some information on the Tang-la Range:

Crossing the two branches of the Toktomai, which meet at the base of the Bukamangna, we saw from the low hills to the south the high and snowcapped Kurban-habsere, a shoulder, as well as I can judge, of the Great Dang-la.²

¹ *Route map of explorations in Mongolia and Tibet* by W. Woodville Rockhill in 1891—1892, Scale 1:2,027,520.

² W. Woodville Rockhill: *A Journey in Mongolia and in Tibet. Geogr. Journ.* May 1894. Vol. III, p. 357, 370 et seq. *Cp. Land of the Lamas*, p. 174.

Rockhill says further in his lecture:

Our route led in a westerly direction along the base of the Dang-la till we came to the extremity of this great range, and found ourselves on the vast lake-covered plateau which some 600 miles further west becomes the Pamir, but is here known to the Tibetans as the Naktsang. South of the Dang-la we were in Tibet, for the desert we had just crossed is a no-man's land . . .

In a note he says:

The importance of the Dang-la, which in lat. 33° stretches from long. 90° E. to 97°, on the climatic conditions of the Tsaidam and north-east Tibet, cannot be over-estimated. With an average elevation of probably some 20,000 feet above sea-level, it intercepts the moisture-laden clouds driven from the south-west by the monsoon. While its northern slope is a comparatively dry, arid waste, its southern is during nearly half the year deluged with rain, hail, or snow. The high, rugged range to the east of the Dang-la, and to the south of the Upper Hwang-ho (Soloma) exercises a similar influence on the climate of east Tibet.

The routes taken by GRUEBER and DORVILLE, SAMUEL VAN DE PUTTE, HUC and GABET, PRSHEVALSKIY and ROCKHILL were more or less in the vicinity of the common high road of the Mongolian pilgrims to Lhasa. The journal of a distinguished Durbet pilgrim who travelled in 1892, was translated in the Russian Legation at Peking by orders of COUNT CASSINI, and sent to the Asiatic department. It was published by the Geographical Society of St. Petersburg in 1895.

We do not need to enter upon any details of the narrative. The Mongol pilgrims usually assemble in the neighbourhood of Koko-nor every year in the fifth or sixth month and then travel in great number to Nakchu.¹ It is a pity that no details are given regarding the journey to this place. We are only told that it was performed without any accidents. From Nakchu an 8 days' journey was calculated to Lhasa, riding on yaks and mules, and 40 versts a day. The second day the pilgrims passed a large prayer wheel, and the third day they passed east of the snowy mountains of Samdan Kansar. They saw eight »suburgans» of brick, built at the sources of the river Dam. — After the visit to Lhasa they went to Tashilunpo and other sacred places.²

The intimate connection between the Tang-la and the Jang-tse-kiang is pointed out by W. R. CARLES in his article *The Yangtse Chiang*.³

Between the Tangla mountains, whose south slopes drain into the Tsang-po and the Salwin rivers, and the Kuenlun mountains, which form the south buttress of the Tsaidam steppes, the Yangtse Chiang, even at its source near the 90th meridian, draws on a basin nearly 240 miles in breadth from north to south. Below the confluence of the three main streams this basin is somewhat contracted by the north-west south-east trend of the Baian

¹ Or Napchu as it is spelled by the translator.

² Замѣтка о путешествіи Дурбетскаго Хамболамы Монкочжеева отъ Нанчу до Сачжацуна въ 1892 году. Извѣстія Имп. Русск. Геогр. Общ. Томъ XXXI. С.-Петербургъ, 1895, p. 568 et seq.

³ *Geogr. Journ.*, Sept. 1898. Vol. XII, p. 225 et seq.

Kara range, and the river is gradually deflected southwards. From the 99th meridian its course is almost due south . . .

The Ma-chu or Chumar mentioned by A—K— is identical with the Mongolian Napchitai-ulan-muren and is one of the feeders of the Yang-tse. About this Chumar WELLBY got the information: »that the river we had followed was no other than the Chuma, whose very source we had found. They told us that it flowed through the Golok country, thence on to Tachien-lu, into the Yangtse.»¹

The mountain system dealt with in this volume is crossed both in its western and eastern parts by old caravan roads of the greatest historical, mercantile and religious importance. The western road, over the Kara-korum Pass is chiefly of a mercantile character, the eastern road is every year travelled by many Mongol pilgrims.

Dealing with the trade of Tibet V. F. LADIGIN has some rather interesting information to give regarding the pilgrims' road, though, as usual, the geography and orography are very much neglected.² In the northern part of the region we may distinguish between several different roads, which finally join to one great road crossing the high parts of Eastern Tibet. From Mongolia one road goes over Sining, Koko-nor, Tsaidam and through Eastern Tibet. This is the so called »Mongol road», exclusively used by Mongol pilgrims, on account of its being comparatively safe from plundering raids. Another road takes the direction of Sining, Koko-nor, Eastern Tsaidam and Western Kam.

The Mongol pilgrims from Urga or from the Khalkha regions in general, as well as those from Transbaikalia travel to the camps of the Tsaidam Mongols, where they finally complete their equipment. Their road goes through Ala-shan, Lian-chew and Koko-nor, or from Kobdo to Su-chew and Nan-shan. They have not only to think of the means necessary for their equipment and supplies on the long journey, but they must not forget the presents with which to please the Dalai Lama. Silver is necessary to hire animals, to buy provisions, and to deliver to the gods, and every pilgrim tries to give as much as possible to the Dalai Lama wishing to attract his special attention.

Mongolia is a vast country and sends every year an enormous number of pilgrims to Tibet and with them also their wealth, which is heaping itself in the course of the years. Every Mongol, even if he be a poor man, dreams of heaping so much silver that he may once be able to walk or travel to Lhasa and see, or, if he is lucky, to receive the benediction of the Dalai Lama. Thus the mass of wealth in countries bordering upon Russia is completely directed from her in the opposite direction — to Tibet, and from it, to India. That is to say, in clearer words, this wealth goes to England.³

¹ *Geographical Journal*, Sept. 1898. Vol. XII, p. 270.

² В. О. Ладыгинъ: Нѣкоторыя данныя о положеніи торюван въ Ганьсу, Тибетъ и Монголіи, собранныя во время экспедиціи 1899—1902 г. снаряженной Императорскими Русскими Географическимъ Обществомъ въ Центральную Азію. *Извѣстія Императорскаго Русскаго Географическаго Общества*. XXXVIII, Томъ 1902. С.-Петербургъ, 1905, p. 371 *et seq.*

³ With this should be compared what Colonel MARK S. BELL says: »Mongolia is equally at Russia's mercy, granted that she pushes on her communications and China does not.» *Proceed. R. G. S.* Vol. XII, 1890, p. 93.

In Tsaidam the pilgrims gather together in great parties, hire camels, and start in June through the »khoshun» of the Taitshinar to Lhasa, on the same road that was chosen by N. M. PRSHEVALSKIY. In Nakchu they change their camels for yaks, as the further road to Lhasa is not practicable for camels. This information is nearly the only place in this report from which one may get an idea of the general morphological character of the country. The Olots and Torguts from Ili and Yuldus travel more seldom to Lhasa. They follow the southern slopes of Eastern Tian-shan to Hami, from where they cross the Gobi to Sa-cheo, and further *via* Sirting and Kurlik, reach the »koshun» of the Taichinars. This road is more comfortable than the one taken by the Khalkhas, as there is more pasture for the camels.

In 1899 G. TS. TSIYBIKOFF (or Zybikoff) started on a journey to Lhasa, equipped and prepared by the Russian Geographical Society. He begins telling us that he will not say anything of his journey through Amdo, thus omitting the part most interesting to us from geographical point of view.¹ He travelled with a caravan of pilgrims. After 22 days through the »uninhabited north-Tibetan plateau land», they camped at the river of San-chu at the northern foot of the Bumsa Pass, from the neighbourhood of which PRSHEVALSKIY had returned on his third expedition.

The caravan, which had started from Kumbum April 24th 1900, consisted of about 70 men, nearly all Amdo and Mongol lamas with 17 tents. Their 200 horses were from Amdo. — From Bumsa they travelled in four days to Nakchu-gompa. During the rainy season the river cannot be crossed.

Three rather long marches took the caravan over the watershed between Nakchu and Uï-chu, and a vast plain called Sun-shan, at the western side of which the mountains of Samtan-Kansar are to be seen. From there the road continues across Chor-la to the Dam valley, inhabited by the descendants of the Mongols, who, in the middle of the seventeenth century, were brought to Tibet by the Khoshot Gushi Khan.

From Kumbum to Lhasa they were three months on the road.

Speaking of the Snow Land of the Tibetans he adds: »Indeed, in the region through which we travelled, we saw two snowy mountains, Samtan-Kansar at the eastern end of the Nian-chen-tang-la Range and the Range Kar-là at the S. W. side of the ring-shaped lake Jamdok.» This cannot be correct as the Tang-la System has both snowy peaks and glaciers, described by other travellers, among them Count DE LESDAIN (see below).

¹ Г. Ц. Цыбиковъ: *О центральномъ Тибетѣ. Извѣстія Имп. Русск. Геогр. Общ.* Томъ XXXIX. 1903. С.-Петербургъ, 1905, p. 187 *et seq.* A summary of this article, *Voyage de M. Tsybikov à Lhasa et au Tibet*, is to be found in *La Géographie*. Tome IX. Paris 1904, p. 24 *et seq.* — The same article is *in extenso* translated into English: *Lhasa and Central Tibet*, and published together with the interesting photographs taken by Tsybikoff.

In Vol. III, p. 223 *et seq.* I have discussed the part of Count DE LESDAIN'S journey from July 1904 to November 1905 that deals with his crossing of the Trans-himalaya.¹ Here we have only to remember his crossing of the Tang-la.

On August 18th, 1905, he camped at Ulang-miris a very swollen tributary to the Yang-tse-kiang. August 23rd, the day after he reached the main river which he followed for four days, he says:

Nous pouvions apercevoir en face de nous les sommets tout blancs des monts Dang-la. Ils semblaient former au sud une barrière difficile à franchir, et dont nous devions cependant nous rendre maîtres si nous voulions suivre le Yang-tse jusqu'à sa source.²

The Yang-tse had cut its way through narrow gorges. In this region he came across the first Tibetan yak hunters. His description of these regions is interesting, and therefore it is a pity that his little map is quite insufficient, and it is impossible to follow the details of his itinerary. However, travelling up the valley he found no possibility to cross the river, and therefore tried another valley taking him to the west. Here he had a very trying journey of three days. The soil consisted of soft muddy swamps. He is right in saying:

Au Thibet la boue produite par le dégel, dans des cuvettes ou vallées sans écoulement, s'étend pendant des dizaines de kilomètres sur une épaisseur parfois si considérable qu'on ne la peut mesurer. Des animaux peuvent disparaître dans la boue comme dans du sable mouvant; . . . dans toute une journée de marche, on ne rencontre pas un seul pied carré de terrain capable de porter le poids du corps sans s'effondrer . . .

In this valley the caravan was nearly lost. Out of 50 mules only six came through, and almost all provisions, except for four days, were lost, together with collections and other things. Finally a valley was found leading up to one of the snowy passes to the S. E. »du grand demi-cercle que forment les monts Dang-la vers le nord«. Nearly everything went down into the mud. L'une après l'autre, nos pauvres mules avaient dû être abandonnées au sort horrible d'un engloutissement dans les flots de boue. Seeing that one mule after another was sinking in the mud it would perhaps have been better to try another passage. But it may be that the whole crest of the range consisted of soft mud, as I experienced at a place not far from this, in 1901.

Le 27 août, nous commençâmes l'escalade des monts Dang-la que nous entreprîmes par le côté est et non par les passes de l'ouest, afin d'être plus sûrs de retrouver le Yang-tse après avoir franchi leur grande barrière de glaciers.

Now the passage was easier as the rocky ground supported the weight of the caravan. At the top of the valley the glacier was reached that crowned the summit of the pass. Between the snout and a moraine a passage was found. At the top of the pass Lesdain says:

¹ *Voyage au Thibet, par la Mongolie, de Pékin aux Indes.* Paris 1908.

² *Op. cit.*, p. 304.

A l'est et à l'ouest, nous comptions des pics neigeux en quantité, au sud, le glacier que nous venions d'escalader se prolongeait, descendant la vallée en vagues glacées ne s'arrêtant que plusieurs centaines de mètres au-dessous du niveau que nous avions atteint.

En suivant le lit dangereusement incliné d'un torrent qui se formait sous le glacier même à la fonte des neiges, nous descendîmes jusqu'à sa base sud

Here they camped — height of the top of the glacier (and probably pass) = 20,600; Camp. 19,300.

The next day they again reached the Yang-tse, now a little stream running S. E.—N. W.

Evidemment, les monts Dang-la apportaient quelques larges affluents pendant la partie de son cours que nous avions été obligés d'abandonner. Exactement à l'est du point où nous avions fixé notre tente, une énorme brèche dans le cercle des montagnes indiquait le point où le Yang-tze se frayait un passage.

Though this description is not quite clear it proves that the Tang-la in this region is an enormous mountain system with mighty peaks and extended glaciers. During the next two days he proceeded 40 km. to the S. W. On all sides the horizon was closed by glaciers.

Le 1er Septembre, nous laissâmes le glacier où le Yang-tze-kiang prend sa source, sur notre droite, deux heures après avoir quitté notre camp, et nous traversâmes une ligne de partage des eaux sur la cime de l'arête latérale des monts Dang-la. C'est environ au milieu de cette arête que le Yang-tze prend sa source, et la passe en forme de selle que nous franchîmes s'étendait entre le groupe de glaciers d'où le grand fleuve s'échappe et un autre groupe un peu moins important.

In the absence of a map we feel uncertain regarding our whereabouts. It does not seem absolutely sure that the main river of the Yang-tse issued from these glaciers. There is a photo: *Les sources du Yang-tse-kiang (7,000 mètres d'altitude)*. Seven thousand metres is very near 23,000 feet. The glaciers of the Tang-la certainly reach much lower altitudes, and Lesdain has just said (see above) that the height at the top of the glacier was 20,600 feet. Of course the source of the river must be reckoned at the snout of the glacier which is its first and original feeder, for otherwise it has to be placed at the highest *névés* feeding the glacier itself. On the other hand Lesdain is no doubt right in placing the source at a glacier, a combination that is very common on all the borders of Tibet.

September 5th he reached Lake Nam-tso-nak from where he continued to the Kalamba-la.¹

¹ Cf. Vol. III *supra*, p. 156 and 223 *et seq.*

CHAPTER XLIII.

NOVITSKIY, NEVE AND STEIN.

For our purpose it would be utterly superfluous to mention every European traveller who has crossed the Kara-korum Pass in recent years. This road is now a well beaten track, one of the highroads of Asia. I will only mention Captain H. BOWER who in *A trip to Turkistan*¹ describes the journey he undertook with Major CUMBERLAND and in company with the already mentioned DAUVERGNE. They crossed the Kardong-la, found the Saser-la to be 17,800 feet, and the Kara-korum Pass 18,550 feet. From Shahidullah they went down the Kara-kash River, which had to be forded twice, while the tributary Togri-su was crossed only once. Then they took the road over the Kilian-davan. Near Ak-masjid they met PIEV-TSOFF'S expedition. Farther on they proceeded to Kotal-i-Kandahar, Taghdumbash and the Hunserab Pass. On his journey BOWER met GROMBETCHEVSKIY and his companion CONRAD, as well as YOUNGHUSBAND.

I will also mention the journey of Colonel V. F. NOVITSKIY who in 1898 on his way from India to Fergana crossed our mountains.² He took the ordinary road from Srinagar over Kargil to Leh and thence turned north on well-known roads. His narrative does not contain anything that is of geographical importance, but some of his observations are not without interest, and he describes the road in detail.

June 24th (old st.) he left Leh and took the Kardung Pass or Laoychi, which he gives an altitude of 17,570 feet. Then he passed Nubra, Changlung and the Lasket Pass (15,200 feet). He does not make any clear distinction between the different ranges of these high regions, as he says:³ »I shall call this vast mountainous country the Karakoram Highland, after the name of the highest pass, which crosses

¹ *Geographical Journal*. March 1895. Vol. V, p. 240 *et seq.*

² *Изъ Индіи въ Періану*. (Description of a journey undertaken in 1898 from Panjob through Kashmir, Ladak, the Karakorum Mountains, Raskem and Kashgar to Russian Turkestan.) Записки Имп. Русск. Геогр. Общ. Томъ XXXVIII, Но. 1. С.-Петербургъ, 1903. Under the same title the lecture held before the Imp. Society, August 7th 1899, is printed in the *Извѣстія*, Томъ XXXV, 1899, p. 147 *et seq.*

³ *Op. cit.*, p. 115.

the principal bulk of the mighty Kuen-lun.» This view is rather to fall back upon HUMBOLDT'S and RITTER'S standpoint which had been abandoned some 40 years earlier.¹

Saser-la he says is 17,800 feet high. At its eastern foot he camped on the Shayok at a place he calls Sirsil. From there he went up on the right bank of the river. Eight times he had to cross it, but never had more water than to the saddle, or so as to make the luggage wet. The guides went in front and measured the depth with poles. Very little snow was seen on the mountains around — as is usual in the middle of summer. But at some versts from Sirsil, on the right side of the river, rises the magnificent snow-group Ak-tash, the height of which he estimates to be 24,000 feet.

Then comes the most interesting passage in his narrative, regarding the Kumdan Glaciers:²

From it (Ak-tash) a long but narrow glacier is stretching down in the valley, providing with water a wild brook, which falls into the Shayok. Some 16 versts beyond it one finds the colossal glacier Chum-Khumdan, the sources of which are to be found in the mountains which are situated far to the west. All these glaciers proceed to the very bottom of the valley, having their lowest edge at a height of 15,300 to 15,700 feet over the sea. The front edge of Chum-Khumdan has a breadth of about one verst and is broken off in vertical ice-walls, being 30 to 40 sashen in height. Near its end the glacier represents an accumulation of colossal ice blocks, some of which have taken extraordinary original and capricious forms. From under the glacier a brook is streaming, joining with the river and at some places covered with ice; an ice-covering is also beginning already here on the Shayok, which from here becomes much smaller.

He camped above the glaciers at a height of 15,800 feet. There is not a word of any difficulties in passing between the front of the glaciers and the right bank of the river, and only the next days he went over to the left bank. From this description we may conclude that the glaciers in 1898 ended at about the same point as in 1892 as described by GRENARD. It is curious that Novitskiy mentions

¹ When I passed through St. Petersburg in 1899 starting on my expedition to Eastern Turkestan and Tibet, 1899—1902, General O. VON STUBENDORFF had the great kindness to provide me with several maps of the interior of Asia, amongst others the sheet «Leh, Simla, Dehli» of the large map of the regions situated to the south of the boundary of Asiatic Russia. (*Карта Южной Пограничной Полосы Азиатской России. Издание Военно-Топографическаго Отдѣла Глав. Штаба. 1898.*) The sheet which was very important for my purposes had not yet been published, so I only got it in proof. Only a part of the Kuen-lun System had so far been drawn. As to the Kara-korum a curious mistake has been made. The draftsman has not known that the expression Karakoram Mountains of the British-Indian map which he has obviously used as a source, belonged to a mountain system, for he has made two districts out of the name, the one to the west called Каракорамъ (Karakoram), and the one to the S. E. of it, called Моунтайнсъ (Mountains). He has believed that the English word Mountains was the Turki name of a district! And still Lieutenant-General Stubendorff, Major-General Bolsheff and, the constructor of the map, Vasiliëff, have their names printed on the sheet. One gets the impression that, in 1898, none of the officers of the topographic department of the General Staff understood English. Between the two «districts» we find, however, Пер. Каракурумъ or the Kara-korum Pass with the altitude of 18,550 feet.

² Op. cit., p. 131.

only one Kumdan Glacier, which must be in reality the Kitchik Kumdan. For the Chong Kumdan must, in 1898, have been at a considerable distance from the river, and, as it is much covered by moraines, may have escaped Novitskiy's observation.

Then he left the Shayok and turned to the right on the little rivulet Chipchak, which comes from the east. »At the place where we left the Shayok, it flows out from a long, narrow inundation, covered with ice (Tso). This inundation looks like a small lake, and is fed with water from the brooks, which in great abundance are flowing down from the many glaciers which surround it.» This description can hardly be brought into accordance with his statement that the Chipchak, which is only a brook of 3 to 5 sashen breadth, has perfectly clear water, whereas the Shayok is very muddy. For otherwise a river passing through a lake becomes clear, as is well known. But in this case the »tso» may have been too small to allow the water to get rid of the material it kept in suspension.

He places the source of the Chipchak in the Kara-korum Pass itself. Over the Suget-davan he went down to Shahidullah, and then crossed the Karlik-davan (17,500 feet) west of Kilian-davan. The Karlik-davan is in the same range as, and between, Yangi-davan and Kilian-davan. Over Karghalik he reached Yarkand. A good map is added to this narrative.

Amongst those who have crossed the Kara-korum Pass, at an earlier date, was also the adventurous Colonel ALEXANDER GARDNER who travelled from Yarkand to Leh as a pilgrim wearing the *haji* dress. Both Sir HENRY YULE and Sir HENRY RAWLINSON speak in a very flattering way of his achievements, and NEY ELIAS believed in him. But his narrative does not afford anything new from our regions and does not allow us any conclusions regarding the Kumdan Glaciers at his time. He has very little to say of the Kara-korum Pass, »no doubt because it was really much easier travelling than many passes which he had already traversed».¹

In the history of exploration in the High Kara-korum the late Dr. ARTHUR NEVE occupies a very prominent place. He has undertaken very important, daring and difficult glacier wanderings and climbings himself, he has assisted with his great experience nearly all expeditions in these regions,² and he has given very valuable contributions to the attempts of systematic orographical classification of the Kara-korum System. In the following pages his name will be met with at several occasions. Here I will only enter a few words on one of his first mountain trips.

¹ *Memoirs of Alexander Gardner*. Edited by Major Hugh Pearse. Edinburgh & London 1898, p. 155.

² I am highly indebted to Dr. Neve for the kind help he always gave me at Srinagar on the three occasions I passed this town on the road to and from Tibet. — Cp. *Transhimalaya*, Vol. I, p. 23 — and *Geographical Journal*, Vol. XXXVIII, 1911, p. 356 *et seq.*

In 1899 he travelled from Leh, the Nubra valley, Tigar and up to a top, which he christened Panimik Peak. The glacier in front of him drained to the west into the Pokachu valley, and part into the Chamshing valley, to the east and south.

In front of us and everywhere cutting off the peaks of our nullah from the central Saser range, was a sheer abyss, 2000 feet deep. The nearest peak had over 25,000 feet, and is somewhat table-topped, with loftier ice-cliffs at the summit overhanging the precipitous sides. The other peaks, each over 24,000 feet, were quite separate, and lay further away, and to the east and south-east. — These great peaks may be regarded as the extreme east termination of the great Mustagh range, which extends from here to the north-west, culminating in the lofty peak known as K_2 , or Mount Godwin-Austen, and beyond that blends with the Hindu-Kush.

The only pass at present practicable in this range is the Saser Pass, from the Nubra to the Shayok valley;

About the Shayok River NEVE says:

From the ferry at Tsati to the sources, a distance of perhaps eighty miles, the valley is very wild and seldom if ever traversed, except for the small portion between the Saser and the Karakorum passes on the Yarkund road. A generation ago there was a great flood which has left its mark on the valley for a fortnight's journey down. It appears that a side glacier crossing the Upper Shayok dammed back its waters to a height of two or three hundred feet, forming a vast lake. But the following year the dam gave way suddenly, and a flood-wave of great height, carrying rocks and bushes with it, swept down the gorges, devastating any villages placed near the river, and even sweeping back up the Nubra valley, and ruining extensive tracks of cultivation by the immense deposits of sand.¹

In connection with his description of the Zoji-la Dr. Neve says of the mountain mass as a whole:

There is ridge beyond ridge, wave after wave, each higher than the other, and all culminating in the mighty masses of the Mustagh. Most of these ranges are parallel to one another, and as the mountains rise, so do the valley troughs between. Kashmir is 5000 feet above the sea, then come side valleys of 7000 or 8000 feet, then further north-east the valleys are 10,000 or 11,000 feet, beyond which come the great plateaux, really open valleys, of Thibet, at a height of 16,000 feet or more.²

Many travellers have crossed the Kara-korum Pass without contributing to our knowledge of the region. PERCY W. CHURCH, for instance, has only the following information to give:

From Brangza there are two roads which meet near the Karakoram. One follows up the Shyok river, and is called the Yepsang route, but the water being rather high it was doubtful if we could get up this way, so we decided to go by the Dipsang way, on which there are no serious water troubles, though it is a day longer, and there are two baddish hills to be surmounted in the valley between Murgu and Kizil Langar.³

¹ *Picturesque Kashmir*. London 1900, p. 132 *et seq.*

² *Op. cit.*, p. 108.

³ *Chinese Turkestan with caravan and rifle*. London 1901, p. 24.

In the first communication delivered by Dr. M. A. STEIN on *A Journey of geographical and archeological exploration in Chinese Turkestan*,¹ he gave us the interesting information of a considerable change in the physical conditions on the Mus-tagh-ata, a change that probably embraced the whole Kashgar Range, and perhaps still more extended mountain regions. In 1894 I had found the northern ridge of the Yambulak glacier passage nearly bare of snow up to an elevation of over 20,000 feet, and had been able to use yaks up to the highest point I reached. In 1900 Stein »found the ridge from circ. 15,500 feet upwards enveloped by heavy masses of snow, which seem likely to transform themselves gradually into a mantle of ice, such as lies over the other elevated slopes of the mountain». Already at about 17,000 feet he found it necessary to leave the yaks behind. Here is the principal factor exercising influence upon the volume of water in the rivers, and dictating the fluctuations of the niveau of lakes in the vicinity, such as *e. g.* we have found when dealing with the Manasarovar.

Stein's journey in the Central Kwen-lun was of very great importance, and cleared up the orographical arrangement in the most excellent way. He was wise enough to concentrate his attention on one special portion of the system which he explored thoroughly. He says:

That portion of the Kuen-luen range which contains the headquarters of the Yurung-kash or Khotan River had hitherto remained practically unsurveyed, the scanty information available being restricted to the sketch map of the route by which Mr. Johnson, in 1865, had made his way from Ladak down to Khotan. Colonel Trotter had, in 1875, expressed the belief that the head waters of the Yurung-kash were much further to the east than shown on that map, and probably identical with a stream rising on the plateau south of Polu. Captain Deasy, working from the side of Polu in 1898, succeeded in reaching the sources of this stream at an elevation of over 16,000 feet, but was prevented from following it downwards. Thus the true course of the main feeder of the Yurung-kash, together with most of the orography of the surrounding region, still remained to be explored.²

When one hears that the peak of 23,690 feet (K 5) at the Upper Yurung-kash was called Muz-tagh by the natives, one cannot help remembering that the Mustack of RENAT was situated at the southern border ranges of the Tarim Basin on his map, and not at the western (Cp. Vol. I, Pl. L). Of this peak Stein says — from the Brinjak Pass:

Muztagh showed itself in full majesty, and beyond it to the south-east there now appeared several distant snowy ridges previously invisible that guard the approach to the main Yurung-kash source. How should we have fared between them if the passage above Issik-bulak could have been negotiated? Further to the south the line of the horizon for a distance of close on one hundred miles was crowned by an unbroken succession of snowy peaks and glaciers.

And further on he says, p. 237: »Far beyond Muztagh we could see glittering ranges in the direction of the main Yurung-kash source.»

¹ *Geographical Journal*. Dec. 1902. Vol. XX, p. 579 *et seq.*

² *Sand-buried Ruins of Khotan*. London M.C.M.III, p. 202.

Stein mentions the Kara-korum which is a spur from the Mus-tagh-ata, proving that the famous name is not a privilege of the great system of »the Black Gravel»:

After Kukyar the route enters a broad stony nullah, enclosed East and West by low walls of conglomerate, which looked like remains of ancient moraines. Above them to the east towered the snow-capped heights of a great spur known as Karakorum, which projects from Muztagh-Ata southwards.

It sounds surprising, but is no doubt correct, when STEIN tells us that he saw the Kara-korum Range in the region of the Kara-korum Pass, from Guma, which is 148 miles away. »The snows I saw glittering far away over the dark lines of the outer mountains evidently belonged to the main range about the Kara-korum Passes. Distances seemed to shrink strangely when I thought that behind those stupendous mountain ramparts lay valleys draining to the Indus.»¹

In mentioning JOHNSON and DEASY as having contributed to our knowledge of the hydrography and orography of the regions of the Yurung-kash River, we should not forget GROMBTCHESKIY and BOGDANOVITCH, though the importance of their exploration never can be compared with that of STEIN carried out ten years later. When Grombtchevskiy in the beginning of January 1890 came from the S. W. and travelled to Issik-bulak, he crossed at 35 km. from that place (37 on Stein's map) Stein's range of mighty K-peaks, and obviously passed a little to the south of Stein's peak of 21,960 feet. Of his experiences on this journey he says:

December 29th (old style) we traversed a very high pass, and travelled down into the basin of the river Yurung-kash. I called the mountain range separating both rivers the Yurung-kash Range, and the Pass the Russian. The pass is not very difficult, but very high According to our guide lower down along the course of the frozen river (Utlak) must needs be a hot spring, at which the water could not freeze. Searching for water we proceeded down the gorge and, at 1 o'clock, at night, really reached a spring, after having lost, on this march, six ponies or one fifth of those of the expedition.²

On Grombtchevskiy's map the range of snowy Kwen-lun peaks is clearly marked, though the different peaks are not to be recognized.³

The excursion of BOGDANOVITCH 1890 from Keriya to Khotan, passing Karangu-tagh, covers a large part of STEIN'S route. He travelled up the Karakash River from Dshegetal to Tam-aghil and Koket-sai, continued to Pishe, from where he made different excursions to Omtesha, Karangu-tagh and Nisa-darya, and returned over Pishe to Buya and over Topecha-davan in Tekelik-tagh to Teremkishlak, Yangi-lenger, and to Khotan, where he met GROMBTCHESKIY.⁴

¹ Op. cit., p. 186. Stein visited Guma in the first days of October. When I was there, December 28th and 29th (1895), the sky was nearly everywhere cloudy and no mountains visible.

² *Известія Имп. Русск. Геогр. Одц.* Томъ XXVI, 1890, p. 327.

³ *Карта Путешествій Б. Л. Громбчевскаго въ Дарвазъ, на Памиръ, въ Канджугъ, въ Раскемъ и въ Сѣверо-Западный Тибетъ, въ 1885, 1888, 1889 и 1890 годахъ.*

⁴ *Труды Тибетской Экспедиции, Часть II.*, p. 24 etc. Cf. his map, *Таб. С. Маршрутная съемка* ibidem, and the general map. op. cit. Vol. I. by M. V. Pievtsoff. — Bogdanovitch calls the great Kwen-lun Range with the high peaks Karangu-tagh. But this is a mistake.

Stein's journey of 1900 had left several problems unsolved as to the uppermost course of the Yurung-kash and of its main feeders.¹

On his second great expedition he solved the Yurung-kash problem definitely. On his previous excursions in the Karangu-tagh Mountains he had felt convinced that the Yurung-kash head-waters were quite inaccessible through the narrow and deep gorges cut down by the river on its course westwards. He therefore decided to attack this wholly unexplored region from the east. His plan was then to make his way to the uppermost Kara-kash Valley along the unsurveyed southern slopes of that portion of the main Kwen-lun Range which feeds the Yurung-kash with its chief glacier sources.

He started from Polur, August 18th 1908, reached Zailik and travelled down to the deep-cut cañon of Upper Yurung-kash. With plane-table, theodolite and photographic panoramas he mapped »the greater portion of the inexpressibly grand and wild mountain system containing the unexplored eastern head-waters of the Yurung-kash«, — »On the south for a distance of over sixty miles, we could see them flanked by a magnificent range of snowy peaks, rising to over 23,000 feet, and all clad with glaciers more extensive than any I had so far seen in the Kun-lun.»

From Zailik he travelled up partly along the river, partly on the mountain spur at its sides to the very source region, which he mapped in minute detail. From there he continued westwards, travelled along the northern shore of Lake Lighten and mapped the upper course of the Kara-kash and its glacier sources.²

Stein has definitely cleared up this complicated region which had been only touched by a few other travellers.

¹ *Ruins of Desert Cathay*. London 1912, p. 172.

² *Op. cit.*, Vol. II, p. 435, 445.

CHAPTER XLIV.

CROSBY, ANGINIEUR, RAWLING, BRUCE.

In the latter half of 1903 a journey was undertaken in N.W. Tibet by O. T. CROSBY. In Tiflis he had met with the French Captain FERNAND ANGINIEUR and they decided to travel together. They started from Polu, and after having crossed a ridge 18,300 feet high, and at the end of another two days' march having again reached a level of 16,500, they turned westward from the way to Rudok two days earlier than ought to have been done, and thus were thrown into the Aksai-chin.

This region had not been anywhere traversed by Europeans, but the compilers of the maps had, as is customary, put in certain features as vaguely reported by natives. These were erroneous, but we, not then knowing definitely our position, were misled by giving some faith to the representations. Finding the mountain system very different from that indicated for what was our actual latitude, and very similar to that indicated for a lower latitude, we were thus confirmed in an error which at the end came near costing our life¹

They followed a valley for 8 or 10 days and discovered two lakes, one drinkable, the other salt. »Both the lakes were new to the maps.» As there is no other map in the book except a very inadequate one, it is impossible to know where those lakes were situated. It is as difficult to find one's whereabouts from the book as I found it to be in those parts of north-western Tibet where I in vain tried to identify Crosby's route. For instance: »Now, ahead of us the mountains closed the way.... The portentous question was, which way? We had evidently passed beyond any opening, if it existed, that would lead us by short line to Rudok. Might we not be near Lanak Pass? That is on the map. Several explorers had crossed it.» Thus, at any rate, it was not the fault of those explorers, nor of the Lanak-la, that Crosby could not know how far from it he was!

Again they reached a ridge of 18,000 feet and came down in a valley which one of the servants from his experiences with WELLBY, supposed was the valley west of Lanak-la. This, however, proved to be wrong.

¹ *Tibet and Turkestan*. New York and London, 1905, p. 82.

After having stayed for a week in »Camp Purgatory» they came to a large valley which, surprisingly enough, proved to be that of the Kara-kash.

The waters which appeared between Camp Abandon and Camp Purgatory were evidently its permanent sources, instead of the much more distant points which the maps had heretofore assigned to that character. Thus our stumbling among the mountains turned to some good account in the laborious effort which man has made to know the globe he inhabits.

They met with some Kirgis who promised to take them on a roundabout road to the Kara-korum—Leh road. The Kara-korum Pass is given as only 18,300 feet high. The Saser Pass was crossed. But it is impossible both from the book and the map to make out whether he went the Murgho or Kumdan route. Therefore he has no right whatever to criticise existing maps,¹ as when he says: »it would perhaps be well to omit these 'noms de phantaisie' from future maps»; and still he says: »The two lakes shown on our route deserve, on the other hand that some name be given them. One, of fresh-water, is possibly that called Lake Lighten by Wellby.» If the travellers themselves could not decide whether one of the two lakes they »discovered» was Lake Lighten or not, who else could be able to do it, and if it happened to be Lake Lighten why should it need a new name? Under such conditions the following observandum is without value: »The error in respect to the mountains is considerable. The dominating chain is not north and south, as heretofore shown, but there are two east-and-west chains, generally parallel to the Kuen Luen . . . »

The same may be said regarding his source of the Kara-kash:

Another correction of some importance has to do with the course of the Karakash, which has been shown heretofore as extending sixty miles or more farther south than is the fact. We chanced to come into the valley of this stream above its permanent sources, which come up out of the sand. There was seen, indeed, a small break in the valley wall, corresponding to the point where the assumed southern extension appears on older maps. But this opening was seen to have a steep incline upward, and no water came from it. Nor can a considerable volume come at any time, as just below this point the valley was crossed completely, from hill to hill, by a very curious line of small stone monuments, about two feet apart, and consisting of small boulders piled about a foot high.

Crosby touched the eastern branch of the river at about $35^{\circ}15'$ N. lat. The southern or western branch is given as beginning at about $34^{\circ}55'$.

In an article *Turkestan and a corner of Tibet*² we find some more details. For instance he talks of some signs of volcanic action at two different places:

One is near Lake Sarakul, and is about 5 miles square. Within that area one may see several true craters and numberless black, tortured masses rising about 75 feet above the surrounding coarse sand. — The second volcanic region was noted near the point marked Camp Desertion. Here the surface of the narrow valley was covered, for a distance of several miles, with characteristic volcanic boulders, and outcroppings of lava in mass showed in the sides of the confining heights.

¹ Op. cit., p. 279.

² *Geographical Journal*, June 1904. Vol. XXIII, p. 705 et seq.

Regarding the supposed Lake Lighten he here says that WELLBY'S route probably »lay a little to the south near the smaller body which is marked with broken lines, and which I saw only from a distance». And further: »This apparently is the lake seen at a distance by Captain Deasy, and suggested by Dr. Stein as the probable source of the Khotan river (!). If this be true, its waters doubtless reappear after flowing through underground channels — a thing not infrequent in these regions.»

Finally Captain ANGINIEUR has written a little book on the same journey.¹ He states they represented the fourth expedition making the route from Polu over the Kwen-lun to Ladak, the predecessors being DUTREUIL DE RHINS and GRECARD, CAREY, and DEASY. Now we are told that they, after having crossed the volcanic region, reached the lakes Atchikoul and Oulongkoul and from a pass of 5,500 m. descended to the valley situated east of Baba Hatoun and being that of the Keriya-darya.

»Continuant à remonter la rivière, nous atteignons ses sources.» He tells us that it was on account of insufficient supplies that they had to give up their original goal, Rudok, and turn to Leh *via* Lanak-la. »La vallée dans laquelle nous cheminons est bordée de chaque côté de chaînes de montagnes infranchissables se prolongeant vers l'ouest.» Then comes the lake, which was 15 km. long and had no outlet, and after it a small lake. To the left and at a considerable distance »a great river» was seen. »Nous retournant, au lieu de nos deux lacs, nous n'en voyons qu'un seul, mais immense, d'où sort le fleuve. Puis, devant nous, nous apercevons un autre lac, dont les eaux surélevées se dressent comme une muraille.» One cannot help getting bewildered.

They went to the N. W. finding the way to the S. W. closed by high mountains. From a pass 5,650 m. high they had to return. »Le 2 Octobre, nous sommes de retour sur les bords de la rivière dont nous avons découvert les sources.» They had no instruments and did not know where they were. Therefore they sent a couple of their men to look out for natives. In the meantime they had to wait for 11 days until these scouts returned with Kirgises and camels. The Kirgises refused to take them to Lanak-la as they had never been there. But they told the travellers that the river they had followed so far was the Kara-kash — »nous ne l'avions jamais supposé. Il en résulte que nous sommes beaucoup plus au Nord que nous ne le pensions.» Thus they followed the Kara-kash for some 60 kilometers to the N. W. And shortly afterwards they reached the great road, and October 26th the Kara-korum Pass.

From this pass they went down through a gorge, »la plus belle que j'aie jamais vue. Sur ses flancs, des rochers géants se dressent dominés par des pics gris et rouges et des glaciers; au fond, un amas de blocs énormes jetés pêle mèle

¹ *En Asie Centrale. Turkestan-Tibet-Cachemir (1903).* Paris 1904.

dans un affroyable désordre». From this short description it seems likely that they went the Murgho route and not by Kumdan, which seems to have been closed on account of the advance of the Kichik-Kumdan Glacier which must have taken place immediately after my passage in 1902.

Anginieur sums up the results of their journey in the following words:¹ »Les résultats du voyage n'ont d'importance qu'au point de vue géographique. Nous avons traversé le désert Aksai-Tchin, ce qui n'avait pas encore été fait, et nous avons découvert les sources tout a moins permanentes du Karakach. La topographie de cette région a été relevée approximativement par Crosby.» It ought to have been mentioned that HAYWARD some 35 years earlier had discovered the sources of the Kara-kash, and that the SCHLAGINTWEITS, JOHNSON, SHAW, and members of FORSYTH'S missions had crossed the Aksai-chin. The map is as poor as CROSBY'S own. The expedition did not add anything to our knowledge of the Kara-korum.²

The same year, 1904, Dr. EMIL SCHLAGINTWEIT did not leave any doubt as to the tremendous dimensions of the Kara-korum System. In his article *Tibet*³ he gives a general view of the mountain systems of Tibet and regards the valley of the Tsangpo as the northern boundary of the Himalayan System. »On the other side of this river the Kara-korum mountains rise in the west, the 'Black Mountains', one of the most inhospitable mountains on the earth, which here form the greatest hindrance to an effective trade.»

An excellent map drawn from the latest information by C. SCHMIDT, accompanies this article. The central lake region is, of course, given exclusively from NAIN SING. The Nien-chen-tang-la is clearly marked. But west of Shigatse there is no, and cannot be any, sign of the Transhimalaya, although SCHLAGINTWEIT regards all the mountains on the northern side of the Tsangpo as belonging to the Kara-korum. Only the ranges NAIN SING saw from his route are drawn, exactly as on his map; 30° North lat. hardly touches any mountains at all. This was in 1904.

¹ Op. cit., p. 102.

² In a review of the book of Captain Anginieur FR. LEMOINE mentions the following results of the expedition: Si la haute région parcourue dénuée de ressources, n'a aucun avenir, le capitaine Anginieur et son compagnon américain ont vérifié les sources permanentes du Karakach, découvert une route qui traverse le désert d'Aksai-Tchin, et M. Crosby a relevé approximativement, à l'aide de la boussole et du sextant, l'itinéraire suivi. — *Du Ferghana au Kachmir par le désert de Takla Makan et le Karakorum. La Géographie.* Tome IX, Paris 1904, p. 313. — If the survey of the route was made by compass and sextant it is a pity that the two books on this journey are provided with such impossible maps. The one of Anginieur is in 1:4,000,000. According to Anginieur's map the southernmost point reached was at 34° 55' North lat., according to Crosby's at 33° 20' North lat. The lines indicating the route do only in a very slight degree resemble one another. Travellers provided with surveying instruments ought to have been able to accomplish a better map. Judging from the French map they travelled north of Lake Lighten and south of Lake Aksai-chin. But this is doubtful as the travellers personally did not know where they were.

³ *Petermann's Mitteilungen*, Band 50, 1904, p. 107.

The same year GRAHAM SANDBERG makes the Kara-korum, with the Kara-korum Pass, continue straight to the east, to 85° , and calls it »Snowy Range seen by Wellby». But the map¹ on which this extraordinary information is given is very rough and cannot be treated seriously.

During the summer of 1903 Captain C. G. RAWLING, together with Lieutenant HARGREAVES and the sub-surveyor RAM SING, carried out his memorable *Exploration of Western Tibet and Rudok*.² Its chief object was the extension of Captain DEASY'S survey made in that direction in 1896.

RAWLING took the way of Lanak-la into Tibet and arrived at the Sumjiling Plain, which had been traversed by BOWER, DEASY and WELLBY. The way to Arport-tso was well known. Rawling turned south-east, keeping first south, then north of Bower in 1890. Then he went due north following Deasy's track at the Antelope Plain, which was the farthest eastern point reached by Deasy. From here he returned to Yeshil-köl, where Hargreaves waited. Lungnak-la, 18,650 feet, was found to be of »partly disintegrated granite». I went, in 1908, a little north of Lungnak-la where everything was limestone.

Regarding the Shemen-tso he found that »at some former date it evidently occupied a much greater area». It was bitterly salt. North of the lake was the »Kiang Plain». From Rawling's map as well as from Deasy's, it is easy to see that the mountains in this part of Tibet are arranged in a much more irregular way than otherwise. »Largot Kangri runs roughly east and west, and from the east end of that range the Aru-tso mountains run south». On the map, however, the former stretches S. E., the latter S. S. E. which is more likely. Then he turned N. E. Of a part of the way to Memar Chaka he says: »Great ridges of limestone lying at an angle of 45° rose on either hand, while the bed of the stream was filled with immense boulders of concrete.» The Memar Chaka was found to be bitterly salt; »signs were plainly visible of the lake having been at some remote period about 80 feet higher than its present level».

The »Deasy Group» was estimated at »well over 21,000 feet».

Regarding »Lake Markham» he made the following observation:

The water of the lake at its western end is fresh, but as one travels towards the east the water becomes more and more impregnated with salt, until at its eastern end it becomes undrinkable. At the time of our visiting Lake Markham there was no overflow, the surplus water being apparently absorbed by the soil, or lost by evaporation. There is, however, a narrow channel at the eastern extremity, which at this date was very dry, but which bore evidence that at some season of the year the water escapes by this channel and drains into the low-lying ground to the north, which is white with salt.

¹ *The Exploration of Tibet*. Calcutta, London 1904.

² *Geographical Journal*. April 1905. Vol. XXV, p. 414 et seq. — and *The Great Plateau*. London 1905, Part I.

This is of course physically impossible. »All around appeared dead; no fresh water, no vegetation, and no animal life.« The country to the east could be clearly seen and easily mapped; so he turned south.

The ranges in this region ran north and south. »The mountains are composed of limestone, which was much disintegrated.« Gold-diggings were seen at many places. Then he went south-west-wards, and saw several salt lakes; in some places only salt pans remained. But Huping-tso was fresh. The Aru-tso was fresh, although BOWER on 1890 had found it salt and DEASY in 1896 drinkable.

This is certainly worth recording, if only for the reason that, as this change has been shown to take place in one great lake of the Tibetan plateau, it is quite possible that at certain seasons or periods other lakes may become altered in character.

I have tried to explain this apparent contradiction elsewhere and shown that the statements of the three travellers do not permit a comparison, as they struck the shore at different places. BOWER touched the lake at its northern end. DEASY'S route, according to his map, ran at some distance from the western shore of the lake; and it was at the southern end that RAWLING touched the lake. It is evident that the salinity can vary a good deal at different places along the shore of a lake, chiefly because of the presence of fresh-water springs.¹

Of the Bum-tso he says that it probably at some season overflows its banks; otherwise its waters would be salt. It is, however, more likely that the lake has an underground outflow. Some days N. E. of Bum-tso everything was sandstone and shale. Then he approaches well-known ground at Noh and Panggong-tso. Of the results he says: »Altogether our travels carried us over 8000 miles of country, the greater part previously quite unknown to the European, while an area of 35,000 square miles was accurately surveyed.«

GRAHAM SANDBERG identifies the Aru-tso, or Tsarul-tso as he thinks is the correct name, with the Ike Namur Nor of older maps. For the Tibetan word Tsarul is equivalent to the Mongol word Namur. Thus Tsarul-Chhe Ts'o should be the same as Ike Namur Nor or »Big Harvest Lake«; and Tsarul-Chhung Ts'o the same as Bakha Namur Nor or »Little Harvest Lake«. He finds this etymology likely on account of the scarcity of good pasturage.²

Our region in Western Tibet was crossed in 1906 by Major C. D. BRUCE, accompanied by Captain LAYARD. They went over the Chang-la, Marsimik-la and Lanak-la, the latter 17,750 feet high. Bruce says of the crossing to the Kwen-lun:

Over the first portion, from Leh to the Kuen Lun, previous exploration has been chiefly confined to various surveys and attempts to obtain an alternative route between Ladak, or Rudok, and Chinese Turkestan, for such seems to have been the idea actuating

¹ *Scientific Results of a Journey in Central Asia 1899-1902*, Vol. IV, p. 521.

² Graham Sandberg: *Tibet and the Tibetans*. London 1906, p. 47.

some of those who have faced this inhospitable country. From the time when Dr. Thomson, the associate of Cunningham and Henry Strachey in the Ladak boundary commission of 1847, first surmounted the Karakoram range, and that of the Schlagintweits, this wild region has always exercised a fascination peculiar to itself.¹

Of the region near Lanak-la he says:

Common to both sides of the border are the high plateaux, whose surrounding ranges reach over 17,000 feet There are also many ancient lakebeds plainly marked, where the evidence of previous glacial action may usually be traced.

And further:

For two days previous to entering the Baba Hatun valley, our way had lain over perhaps the worst ground we had to cross in Tibet. West of the valley we were following ran a magnificent range of eternally snowclad mountains, whose highest peaks, which later form one boundary of the Baba Hatun valley, reach over 21,000 feet. Such a landmark do these form that, though no new discovery was involved, we felt that as a geographical feature they ought to carry a separate name. We therefore took the liberty of giving them that of the Curzon range. Opposite to this latter, on the N. E. side of the same valley, stands a wonderful group of rugged peaks and ridges also covered with eternal snows. Both offer on either hand as grand and awe-inspiring a view as the human eye could wish for. We again felt that such a unique mass of peaks deserved recognition and a separate entity, so took the liberty of giving it the name of the Kitchener Group.

North of the Baba-hatun valley Bruce crossed a pass 17,750 feet high which he calls Ak-Su-La, a name that cannot be correct as it ought to be Ak-su-davan. Of the Gugurt plain he says:

This is a wide open expanse, some 18 miles in length from east to west, with a greatest breadth of 6 to 7 miles from north to south; and of the eastern portion of the same:

Both hollows and ridges are thickly sown with an outcrop of volcanic-looking black rock, which makes progress by no means easy.

The salt lake Ullug-kul, so called by DEASY, was at 15,200 feet. Then he passed Atchik-kul. »All the lakes are either shrinking, which does not appear probable from the surrounding indications, or at other seasons must be 5 or 6 feet above their true level.» This refers to the middle of October.

He does not give the name nor the height of the Kwen-lun Pass he used, but below and on three sides of us, stretching apparently without end, lay the wildest and most forbidding jumble of mountain ranges, peaks, and gorges imaginable.

And: The main gorge, known to the people of Polu at its northern end as the Zubéshic (Subashi?) gorge, was more like a gigantic railway cutting winding through solid rock

To judge from Bruce's map, he followed the same way as FORSYTH'S PUNDIT. From Lanak-la he went to Mangtsa-tso at 16,600 feet. At about 35½° N. lat. and 81½° East long. he has the »Probable sources of the Khotan R.».

¹ *A Journey across Asia from Leh to Peking. Geographical Journal.* June 1907. Vol. XXIX, p. 597 *et seq.*

In the discussion after this paper BOWER stated that his experience in Tibet was »that nearly every lake showed obvious signs of at one time having been very much larger».

Deasy reminded of several problems which still remained unsolved. One of these is the course of the Khotan river from the source down through the Kuen Lun range, considerably to the west of where Major Bruce went.

... It has been of special interest to me to hear that Major Bruce has found another route from the south of the Kuen Lun range into Polu. It bears out I think, the statement which has been made by a good many travellers, that there is no caravan route either from Rudok or Lhasa into Polu and Chinese Turkestan. I have been constantly told that in days gone by there was a regular trade route from Lhasa into Polu, and I made every endeavour to try and verify that statement, but without success.

In his book on his great journey Major Bruce describes our regions thus:

Three days later (from Baba Hatun) found the caravan climbing from the great central table-land of Tibet towards the southern edge of the mass of mountain ridges which separate it from Chinese Turkestan. The former area comprises one of the grandest Alpine regions in the world. — The western portion is made up of the more or less fertile valleys of the Indus and Shayok rivers. North of these are the Ling-Zi-Thang and the Aksai-Chin, — vast highlands, like all North-West Tibet uninhabited and uninhabitable. To these uplands the Karakoram mountains form the northern buttress, elevating this unique series of plateaux thousands of feet above the central basin of Chinese Turkestan.¹

The expedition so well lead by Captain Bruce did not add very much to our knowledge of the Kara-korum.

¹ *In the footsteps of Marco Polo, being the account of a journey overland from Simla to Pekin.* Edinburg and London 1907, p. 54.

CHAPTER XLV.

ZUGMAYER. — STEIN, AND OTHERS.

In 1906 the German Zoologist Dr. ERICH ZUGMAYER undertook a journey through Central Asia, one third of which crosses Western Tibet.¹ He traversed the Kwen-lun from Polu; his highest camp was at 5,950 m. and his highest point reached at 6,300. From the difficult pass Kisil-davan, 5,180 m., he came down to a plain, stretching west and east. On this plain were three small lakes: Sagüs-kul, Atchik-kul, and Ullug-kul. About 100 m. above these lakes he saw what looked like a black line. On closer examination, however, he found that the basin of Sagüs-kul was an »Einsturzgraben«, which also could explain the comparatively low altitude of 4,650 m.

The region south of the lakes is covered by extensive andesitic lava layers, which have their origin in several craters situated in front of the southern snowy range and stretch their apophyses between the Sagüs-kul and Atchik-kul. At the eastern end of Atchik-kul there are also two well preserved craters, and a third one 3 km. farther S. E. They form the boundaries of the sunken part to the south and east. The Ullug-kul is separated by a lava threshold from the Atchik-kul and some 150 m. above the same. The Ullug-kul sends its outflow towards the Keriya-darya, although water flows only at highwater seasons. Thus the lake is fresh. The two other lakes also had fresh-water, in spite of there being no outflow. But he found, curiously enough, that the water at 4½ m. depth and less, was very salt, which proved that the fresh-water only formed a one meter thick layer on the top of the salt-water. Zugmayer thinks this layer of fresh-water is only formed during the season of the melting of the snow. Under such conditions it seems, however, difficult to account for the existence of a fresh-water fauna, crustaceans. And it does not seem likely that in such a windy land the water should not get mixed through and through in a very short time. Zugmayer is of the opinion that the whole basin once was occupied by one great lake which drained to the Keriya-darya; the desiccation of this lake depends on general climatic changes.

¹ Bericht über eine Reise in Westtibet. Petermanns Mitteilungen. 55. Band. 1909, p. 145 et seq.

Near Polu the Keriya-darya leaves the narrow gorge in which it pierces the principal range of the Kwen-lun. This part of its course still remains unexplored and will probably for ever remain inaccessible. DUTREUIL DE RHINS who tried that road had to return. ZUGMAYER again reached the river at Baba-Hatun or Arash; at some places here the breadth is so much as 50 or 60 m. In the prolongation of its valley to the S. W. a little river is regarded as its source, and is marked as such on existing maps, for instance on *Stieler's Handatlas*, where Keriya-kotel is marked as the watershed between the Keriya-darya and Lake Lighten. Somewhat different and also incorrect, the hydrography of this place is given on RAWLING'S map in *The Great Plateau*. This rivulet has only $\frac{1}{16}$ of the volume of the Keriya-darya, which in reality gets most of its water from the watercourse at which Zugmayer's Camps XI—XIII are situated. Zugmayer thus was able to fix the situation of the upper part of the principal branch of the Keriya-darya and to correct the misunderstanding which had hitherto existed on the maps.

Near his camp XII the secrets of the mountains were opened by the deep valley of the river, and he found that the nucleus of these mountains consisted of granite, on the top of which was 20 m. of sandstone, and this again was covered by lava. The lava beds finally were to a great extent hidden by aeolian deposits and detritus.

Zugmayer criticises the maps of DEASY and RAWLING for these regions and finds the Russian 40 versts map much better, although it has the error of identifying Lake Lighten with Yeshil-kul.

Between the tributary of the Keriya-darya which comes from the Keriya-kotel, and the river which goes to Lake Lighten he found a smaller self-contained basin. He believes the name Keriya Kütel is a false etymology, as it ought to be Kara-kotel. I think Keriya-kotel is more correct, at least I only heard this name. The pass Zugmayer crossed between his camps XV and XVI, being 5,690 m. high, corresponds with the Keriya-kotel of the maps. His pass between camp XVI and XVII, being 5,650 m. high, corresponds with the pass marked on the Russian map. Deasy and Rawling have misunderstood the geography of this place.

Zugmayer, finding the form of Yeshil-kul different on all existing maps, says that the lake in reality changes, depending on the amount of inflowing water. A steady desiccation is going on. He had no opportunity to measure the depth but believes, on account of the flatness of its basin, that the maximum depth must be at the most 5 m.¹ From old shore-lines he saw that the lake must have been several times larger formerly than nowadays. At the northern shore, not far from

¹ The greatest depth I measured in Yeshil-kul, 1906, was 16.1 m. *Transhimalaya*, Vol. I, p. 121, and Vol. IV, *supra*, p. 52.

the lake, he found hot springs. From Yeshil-kul a valley goes directly S. S. W. to Apo-tso.

The name of this lake is generally written Arport-tso. Horpa-tso or »Turki Lake» is certainly wrong. Zugmayer writes Apo-Zo or »Grandfather Lake», in connection with some legend, which seems doubtful. He regards it as the highest lake known in Tibet, which agrees with my examination of the heights of Tibetan Lakes.¹ The records of BOWER, DEASY and RAWLING are different from Zugmayer's and differ amongst themselves. In the N. E. is — or was — the effluent, about which the records also differ very much. On the maps of Deasy's and Rawling's journeys the lake drains to Yeshil-kul, a statement which Zugmayer believes to be thus far correct; that the lake formerly drained to Yeshil-kul, but not nowadays. HARGREAVES told Rawling that the effluent was underground, but farther N. E. again appeared bursting forth with great violence, and forming a river of considerable size and sufficiently deep to prevent ponies from fording it. Zugmayer, however, agrees that at very high water-level there may be an effluent even nowadays.

I doubt very much the existence of the four islands Zugmayer believed he saw, and which probably are only promontories from the surrounding mountains. Rawling says the lake does not diminish in area, but Zugmayer found from old beach-lines that it had been very much bigger formerly. The level of the lake was found to be about 8 m. below the sand walls at the north-eastern shore. On these walls four terraces were visible, which correspond to the shore-lines, west of the lake. Beyond, or N. E. of the wall, the ground falls to the N. E., and in the valley some small pools were seen. The old bed was 2 m. deep. Farther down the valley some water appeared from the ground. At the northern shore Zugmayer like Rawling, found the water slightly brackish, which would be impossible if there were any effluent whatever. There are fishes, *Nemachilus*, crustaceans and insects. The form he gives the lake on his map, approaching a regular square, is *a priori* wrong, as it is in reality divided into two basins, connected with each other by a very narrow passage, where I crossed the Arport-tso on the ice in 1908. The plain west of the lake he calls the »Sumdschiling» Plain (= Sumjiling).

The Mang-tsaka is also diminishing as already had been stated by Rawling. As Zugmayer's Camp XXIX, 5,370 m., was about 170 m. above the surface of the Mang-tsaka, he could judge from old beach-lines that the lake must once have stretched the whole way to Lanak-la and included the Arport-tso and Yeshil-kul, and must have been like the Panggong Lakes. In the hot springs of Mang-tsaka he read temperatures of 21 to 40.5° C. In the brook from the sources he found *Nemachilus*, *Limnæa*, and *Gammarus*.

¹ *Scientific Results of a Journey in Central Asia 1899—1902.* Vol. IV, p. 589—592.

Except recent sediments and eruptive rocks he only found in Western Tibet hornblende-granite, sandstone and dark grey limestone with white veins. In spite of his energetic searching he could never find any fossils.

Zugmayer was the first to cross the country between the Sumjiling Plain and the Panggong Lakes. He agrees with Rawling who had stated that these parts of Western Tibet consist of a series of nearly parallel ranges stretching N. W. to S. E. S. W. of Kense-tsaka is a lake, which both Rawling and Zugmayer think drain to the Panggong Lakes; a statement that appears to be very doubtful. From his Camps XXXV to XXXVIII Zugmayer followed the valley of the river which empties into the first lake at Noh, and for which he could not find any name. I had followed the same way in November 1901, and then heard the river called Tsangar-shar by my Tibetan escort.¹

On his map Zugmayer places Lake Lighten N. W. of Yeshil-kul and has a mountain range between the two, a representation that is not in accordance with reality. The mistake is due to the fact that Zugmayer did not himself visit Lake Lighten but had to rely upon the mapping of his predecessors.

From a geographical point of view Dr. Zugmayer's expedition has not brought much new information, but from a zoological point of view it has been very important. The traveller has also published a very well-written book on his experiences and results.²

Although the Kwen-lun is outside of our present discussion and historical review of exploration in Western Tibet, I cannot help mentioning in this connection a few extracts from Dr. M. A. STEIN'S important glacial observations in the Western Kwen-lun during his great expedition of 1906 to 1908, the best geographical work that has been carried out in this region.

From the eastern slopes of the Mus-tagh-ata Range he turned eastwards and made his way through unsurveyed ground along the right bank of the Tisnaf River to the outer Kwen-lun about Kok-yar. He followed a little-known route through the barren outer hills to Khotan at the close of July. His surveyor RAI RAM SING had been despatched for a survey of the snowy range towards the Kara-kash River. He reached it and pushed over the Hindu-tash Pass, about 17,400 feet high, »closed since many years by the advance of a great glacier».³ This was the last bit of *terra incognita* in the difficult mountain region between the middle courses of the two great Khotan Rivers, the Yurung-kash and Kara-kash.

One month was spent in supplementing his surveys of 1900 in the high Kwen-lun Range south of Khotan, and here special attention was paid to the great glaciers which feed the headwaters of the Yurung-kash.

¹ *Central Asia and Tibet*. London 1903. Vol. II, p. 549 *et seq.*

² *Eine Reise durch Zentralasien im Jahre 1906*. Berlin 1908.

³ *Explorations in Central Asia*. 1906—8. *Geographical Journal*. July 1909. Vol. XXXIV, p. 5.

Pushing up rapidly by the route over the Ulughat-Dawan and Brinjak pass discovered in 1900, we reached the Nissa valley after the middle of August, and were soon busily engaged mapping the huge ice-streams which descend towards its head both from the main Kun-lun watershed, and great side spurs thrown out by it northward.

The effects of far-advanced disintegration of rocks, due evidently to extremes of temperatures, were everywhere most striking. The precipitous ridges we had to climb were composed on their crests of nothing but enormous rock fragments and quite bare of detritus from circ. 14,000 feet upwards. Enormous masses of rock débris sent down from these ridges almost smothered the ice-streams below, and made their surface look for miles like that of huge dark torrents suddenly petrified in their wild course. Big ice falls and gaping crevasses showed indeed that these accumulations of débris were being steadily carried onwards by the irresistible force of the glacier beneath. But even there the exposed ice surface looked almost black, and when on the Otrughul glacier I had under serious difficulties clambered up for some 5 miles from the snout to an elevation of circ. 16,000 feet, the reaches of clear ice and snow descending in sharp curves from the highest buttresses of a peak over 23,000 feet high seemed still as far away as ever.

The rate at which these glaciers discharge at their foot the products of such exceptionally rapid decomposition as appears to proceed along the high slopes of this part of the Kun-lun where permanent snow does not protect them, was brought home to me by the almost constant rumble of boulders sliding down the ice wall at the snouts whenever the sun shone through long enough to loosen the grip of the surface ice. Old moraines of huge size could be traced clearly at the head of the Nissa valley down for over 3 miles below the present foot of the Kashkul glacier, at circ. 13,300 feet elevation. Thick layers of loess deposited since ages by heavy clouds of dust as we saw again and again swept up by the north wind from the great desert plains north had charitably covered up these ancient terminal moraines.

The form of the valleys, the rocks and the detritus told plainly the story of rapidly progressing erosion, and the melting of the glacier was proceeding at a great rate; the flooded condition of the rivers made the journey difficult.

Stein speaks of a »difficult route across the main Kun-lun Range, by which communication with Ladak was maintained for a few years during the short-lived rule of the rebel Habibullah (1863—66), and which has long ago become completely closed and forgotten».

When he went down to the valley of Pisha, he had succeeded in clearing up many interesting details of orography in the rugged, ice-covered main range rising south of the Yurung-kash, and in establishing beyond doubt that that long-forgotten route led up the Chomsha valley.

It had become equally certain that any advance through that very confined valley to its glacier-crowned head was quite impracticable during the summer months or early autumn. I also convinced myself that my long-planned attempt to reach the uppermost sources of the Yourung-kash itself would have to be made from the east.

His previous explorations in the Karangu-tagh region had convinced him that the upper Yurung-kash could not be approached through the deep gorges in which the river has cut its way westwards. This could be done only from the east through

a wholly unexplored region. He was completely successful and succeeded in filling up a gap in our knowledge of this part of the Kwen-lun. Through the deep-cut gorges above Polur he reached the northernmost high plateau (c. 15,000), »adjoining the outer main Kun-lun range».

He first reached the deep-cut valley of Zailik, where he found many gold-pits »dug into the precipitous cliffs of conglomerate just above the gneiss of the stream-bed». From Zailik »we managed to ascend from it a series of high spurs coming straight down from the main Kun-lun range northward».

Average height of its crestline — 20,000 feet. From several stations he commanded

the inexpressibly grand and wild mountain system containing the headwaters of the Yurung-kash.

On the south for a distance of over 60 miles, we could see them flanked by a magnificent range of snowy peaks, rising to over 23,000 feet, and all clad with glaciers more extensive than any I had so far seen in the Kun-lun. Now at last I could form a true idea of the unfailing stores of ice which supply the Khotan river with its enormous summer flood, and enable it then for a few months to carry its waters victoriously right through the thirsty desert.

He crossed a succession of side spurs over passes 17,000 and 18,000 feet high, ascended to the extremely confined gorge of the main river, and penetrated to the glacier-bound basin, about 16,000 feet high, where the easternmost and largest branch of the river takes its rise. Stations of 18,000 and 19,000 feet were climbed and geological specimens and records taken. Thus having traced the river to its head he turned east to the Ulugh-kol Lake. His intention was now to follow the great snowy range which flanks the Yurung-kash headwaters on the S. E. and south, westwards along its southern slopes until he reached the uppermost valley of the Kara-kash River. Therefore he had first to march by the Polur-Lanak-la route to the elevated basin (c. 17,000 feet) where the Keriya River rises at the foot of a line of great glaciers. Stein found that the range from which these glaciers descend proved to be identical with the easternmost part of the ice-clad range confining the Yurung-kash sources.

Regarding the Aksai-chin Stein writes:¹

I was heartily glad when at last we left behind the watershed of the Keriya river, and could commence our exploration of the ground westwards which in our atlases generally figures as high plain with the name of Aksai-chin, but which the latest transfrontier map of the Survey of India rightly showed as a blank. Instead of a plain we found there high snow-covered spurs with broad valleys between them descending from the great range which flanks the Yurung-kash sources. A series of large lakes and marshes mainly dry extends along the foot of those spurs, at an elevation of 15,000 to 16,000 feet; but the streams brought down by the valleys rarely reach them, losing themselves instead on vast

¹ *Ibidem*, p. 261.

alluvial fans of detritus But the most dismal ground was still before us when, after a week of long marches from where we had left the Polur-Lanak-la route, we reached a large salt lake which an Indian Survey party appears to have sighted more than forty years ago, but which has now been reduced to the state of a salt-marsh for the most part dry. Marching round it to the north-west, we entered a series of basins absolutely sterile, and showing in their centre a succession of salt-encrusted dry lagoons.

Then he struck Habibullah's route, forgotten since 40 years. Sept. 18th he emerged in the valley of an eastern feeder of the Kara-kash. Then he had to trace Habibullah's route up to the point where it crossed the main Kwen-lun Range towards Karangu-tagh. A line of cairns running up a side valley showed where the pass would have to be looked for. But advancing masses of ice and snow had obliterated all trace of the old route at the head of the valley. Stein's observations in this region would make it likely that the precipitation has augmented during the last 40 years. Such irregularities of a periodical nature are by no means surprising and may easily be traced in other parts of High Asia.

Then Stein ascended one of the great glaciers coming down from the main range towards the Nissa valley, explored in 1906. Finally he went down the Kara-kash valley. His return journey Stein took over the Kara-korum Pass, which he gives a height of 18,687 feet, and the Saser Pass. He had to follow the Murgho défilé, as the Kumdan route was closed in 1908.¹ On October 7th he crossed the Saser Pass.

In the following pages I will only just mention a few publications and journeys which more or less intimately touch upon the Kara-korum System.

In his articles *Les récentes publications sur Lhassa et le Tibet*² and *Nouvelles publications sur le Tibet*,³ J. DENIKER has given a very good summary of journeys and books which had just appeared. Amongst those mentioned we specially note such which were in connection with the British raid into Tibet under YOUNGHUSBAND.

In the same Journal FRÉDÉRIC LEMOINE has a review: *Autour de l'Afghanistan par le Kara-korum et le petit Tibet, par M. le commandant de Lacoste*.⁴ LACOSTE travelled from Meshhed to Sari-kol, and continued from Tash-kurghan to Yarkand which he reached August 7th, 1906. The journey proceeded to Karghalik, Bora, Kilyang, Kilyang-davan to which he gives a height of 5,260 m., Suget-davan (5,380 m.), Kara-korum Pass (5,510 m.), Dapsang (5,390 m.), Saser-la (5,365 m.), Khardong-la (5,390 m.), and finally Leh where he arrived on September 15th, 1906.

About the same time DAVID FRASER got the following impression of the Kara-korum Pass:

¹ *Ruins of Desert Cathay*. London 1912. Vol. II, p. 486. In this important book Stein has given a detailed description of his discoveries and his exploration in the Kwen-lun.

² *La Géographie*. Tome XIII, 1906, p. 103 et seq.

³ *La Géographie*. Tome XV, 1907, p. 345.

⁴ *La Géographie*. Tome XVI, 1907, p. 67 et seq.

The Karakoram Pass is the highest in the world which serves the purpose of an avenue of trade between two great regions. In the Himalayas there are higher passes, but they are seldom used and only on special occasions. And having tried 18,550 feet, one is content never to want to go higher than the Karakoram.

His opinion is that:

the Karakoram route is absolutely impassable to anything more than a mere handful of men. Proceeding westward, the next negotiable opening in nature's barricade is that which passes through Gilgit and debouches upon the Pamirs. Between this and the Karakoram route there is little to choose, for though the latter is higher in elevation the former is much more difficult, owing to the narrowness of the valleys and the precipitous character of the existing track.¹

On his map he uses the following extraordinary names, which are to be regarded as survivals from HUMBOLDT'S time: Kuen lun or Aneuta Mts., and Karakorum Mounts Padishah.

ZUICHO TACHIBANA, who in 1908 travelled at the expense of Count KOZUI OTANI, had the intention to return *via* the Kara-korum Pass and India, but could not obtain permission to do so from the Indian Government.² In *Petermanns Mitteilungen*, however, we are told that he crossed the Kara-korum Pass and reached Leh, October 27th.³ The rest of Tachibana's journey, as his visit to Lou-lan, the old Chinese town I discovered in 1900, falls outside of our regions.

Sir THOMAS HOLDICH points out that the mountains north of India present a good defence against military operations. He says:

Early in the 16th century Mirza Haidar was defeated by the natural difficulties of the country, not by Kashmiri armies — »much, indeed, as a similar expedition to Lhasa was defeated by cold and starvation. No modern ingenuity has as yet contrived a method of dealing with the passive resistance of serrated bands of mountains of such altitude as the Himalayas. No railway could be carried over such a series of snow-capped ramparts; no force that was not composed of Asiatic mountaineers could attempt to pass them with any chance of success.»⁴

Of the Kara-korum road he says:

Here, indeed, in the Trans-Indus regions of Kashmir, sterile, rugged, cold, and crowned with gigantic ice-clad peaks, there is a slippery track reaching northward into the depression of Chinese Turkestan, which for all time has been a recognized route connecting India with High Asia. It is called the Karakoram route. Mile upon mile a white thread of a road stretches across the stone-strewn plains, bordered by the bones of the innumerable victims to the long fatigue of a burdensome and ill-fed existence — the ghastly debris of former caravans. It is perhaps the ugliest track to call a trade route in the whole wide world.⁵

We now again return to the east for a while.

¹ *The Marches of Hindustan*. Edinburgh and London MCMVII, p. 152.

² *Geogr. Journal*. Vol. XXXV, 1910, p. 448.

³ *Pet. Mitt.* 1910, I, p. 208.

⁴ *The Gates of India*. London 1910, p. 187.

⁵ *Op. cit.*, p. 3.

On Dezember 24th, 1908, Lieutenant J. W. BROOKE was killed by the Lolos. A report of his journey, which he had sent home, was published by W. N. FERGUSSON. It is very meagre in geographic detail, and sometimes not clear. He travelled from Tankar to Koko-nor, Tsaidam and Naichi, which he again left March 6th, 1907. Of the Dichu it is said:

There is no doubt that the Dichu, or Dri River, is the main tributary of the Yangtse which is fed from the famous chain of lakes surrounding the west Kokoshili range. These lakes are over 16,000 feet above sea-level, as stated by Captain Wellby and Dr. Sven Hedin.¹

On the continuation of the journey we read:

They crossed the Dungebure, which is 16,700 feet above the sea, with little delay; commencing their march at 8 a. m. and pitching camp at 4 p. m. They experienced little difficulty, although this is the highest pass on the journey between Sining and Lhasa.... The top of the pass was quite flat. On the south side, some distance from the top, Brooke found hot springs gushing out of the frozen earth.... The formation of the Dungebure range was found to be similar to that surrounding the Tsaidam, i. e., red sandstone over a very hard limestone conglomerate, only in addition there were several volcanic spurs in sight....

Here somewhere BROOKE came across the first Tibetan tents at an altitude of 16,000 feet. April 10th he reached the valley of Nakchu, was stopped and had to turn back.

A body of sixteen horsemen escorted Mr. Brooke over the Tangla Pass, where they left him.... After continuing another day's journey north, he turned west hoping to be able to evade the guarded district, and once more made his way south; but after travelling 200 li he was stopped again. He now went up the bank of the Dichu and crossed the Dungebure range by a small road on the other side of the range....

Finally he crossed »a salty desert; the first town he reached was Chichen 130 li N. E. of Tamar; then he passed on to Suchow, Kanchow and Sining».

In his excellent and very well written book on Central Asia G. V. CALLEGARI has the following historical passage on our mountains.

Noi possiamo, alla fine, immaginarci il Bolor concepito dagli antichi come l'Imaus, i Cuenlun come la famosa cintura del Tauro col massiccio dei Tsung-ling o dei Pamir, posto quasi nello stesso luogo in cui il Kircher poneva il suo grandioso nodo montano, che doveva essere »l'hydrophyllacium principale Asiae». E così pure noi vi localizzammo il »Pamer altissima pars continentis» del Mercator, il »Planities Pamer» dello Strahlenberg, il »Pamer Pleine» del d'Anville.²

Regarding our mountains he says:

Caracorum: E una catena il cui prolungamento forma l'Hindu-cush e ne è diviso allo spartiacque dell'Hunza e del Ghilghit a 15 km. ad E. del 70° long. E. Essa sembra terminare ad W. presso il 61° long. E.; più ad oriente non è nota, si crede che s'unisca al massiccio

¹ *Adventure, Sport and Travel in the Tibetan Steppes*. London 1911, p. 33. — Anybody who has had access to my maps, elaborated by HASENSTEIN and published in Petermann as quoted before, will find that my lakes in N. E. Tibet have nothing to do with the Dichu.

² *Il grande altopiano dell'Asia Centrale*. Feltre 1911, p. 75.

dell'Aling-cangri nel Tibet; ma non è certo, non essendo ancora stata esplorata la regione tra questo ed il suo estremo punto orientale. Non s'è potuto ancora provare se si tratti di una catena unica o doppia.

This view is quite correct. He mentions the different ranges, amongst them »Catene del Tibet Centrale» and its different branches.

The same year Professor ALEXANDER SUPAN shows in very clear words, how the Eurasian region of folds begins with the Central Asian Highlands. The oldest mountains are situated in the north, the more recent in the south, and the heights increase from north to south. The mightiest mountain systems of the old world join in the Pamirs, where even the valleys rise above 3,000 m. In the mountain knot of Pamir meet the Tian-shan, the Kwen-lun, the Kara-korum which perhaps represents the continuation of the Transhimalaya, and, finally, Himalaya, the mightiest mountain system on the earth. North of the Kwen-lun vast deserts and steppes extend, forming high plains. Between the Kwen-lun and the Transhimalaya rises Tibet, the highest upheaval of our planet, probably a land of folds, the mountain systems of which perhaps are curved in the same way as the different ranges of Transhimalaya, and separated from each other just as there. At 70° East. long. the region of folds narrows to the contracted mountain-isthmus of the Hindu-kush, which joins the Central Asian Highlands with those of Western Asia.»¹

A few years earlier or in 1904, Professor WILHELM SIEVERS had made a successful attempt to classify the Kara-korum System orographically and geologically:

Karakorum oder Mustag heisst eines der höchsten, grossartigsten, aber auch ödesten und unwirtlichsten Gebirge der Erde Sein Westende liegt unter 75°, sein Ostende wird bei 79° angesetzt, aber es scheint, dass es sich über diesen hinaus weit nach Tibet hinein fortsetzt Es besteht aus drei parallelen Zonen, und zwar schliesst sich an eine nordöstlich vom Indus beginnende, 97 km breite Gneiszone ein 50—60 km breites Band von paläozoischen und mesozoischen Gesteinen und endlich gegen den Kwenlun hin ein 60 km breiter Gürtel von kristallinen Schiefern an. In der zweiten Zone sind hauptsächlich dunkle Schiefer, Sandsteine und dolomitischer Kalkstein vertreten, letzterer von triadischem Alter. Somit unterscheidet sich der Karakorum vom Himalaya besonders durch das Fehlen des Tertiärs, das noch am linken Indusufer ansteht, und durch das Zurücktreten der Triasformation, des Jura und der paläozoischen Ablagerungen gegenüber den archaischen Felsarten. Während ferner die letzten Faltungen des Himalaya in das Ende der Pliozänzeit fallen, müssen die Ketten des Karakorum bereits am Schlusse der Triaszeit gefaltet worden sein, sind also weit älter als jene.»²

¹ *Grundzüge der Physischen Erdkunde*. Fünfte Auflage. Leipzig 1911, p. 37.

² *Asien*. Zweite Auflage. Leipzig und Wien 1904, p. 457.

CHAPTER XLVI.

THE GLACIATION. KRAPOTKIN. SOME RECENT EXPEDITIONS.

There exists a whole literature on the glaciation of the Himalayas and Karakorum, and several specialists on physical geography have in later years directed their attention to the question of glacier movements and their relation to precipitation, monsoons and other meteorological elements. The Geological Survey of India, and several private scholars, as Mr. DOUGLAS FRESHFIELD and M. CHARLES RABOT have devoted much attention to the problem, collected and compared materials. It would take us too far to enter upon this question here, and it is better to wait until more definite and reliable results may be gained from richer material of a sufficiently long period of observations. In this connection I will only mention two or three contributions to the solution of the problem.

In 1903 Professor DAVIS, and Messrs. HUNTINGTON and R. W. PUMPELLY travelled in Central Asia. Their exploration proved the existence of several successive glacial epochs in the mountains of High Asia during the glacial period.¹ »Each of these epochs of glacial expansion must have had its echo in a corresponding expansion of the water area, and in a reaction on the climate of the basin region itself in the direction of local precipitation and amelioration of the desert conditions.«

The processes reviewed by the Americans were found to have been operating with fluctuating intensity since Tertiary time. The maximum of intensity existed probably as a consequence of the glacial period. Glacial epochs were accompanied by swollen rivers with broad flood-plains, expansions of the seas with extensive marshes, and by great extents of loess-steppes. During interglacial epochs the conditions were reversed, and subsequent to the last glacial epoch there began the general trend towards the present condition of aridity — a trend that was interrupted by oscillations, in some of which the aridity may have exceeded that of to-day — a process in which the seas, while responding to the oscillations, have in the main shrunk gradually to the volumes compatible with the present equilibrium between precipitation and evaporation. Parallel with this progress toward

¹ Raphael Pumpelly: *Explorations in Turkestan, 1904*. Vol. I. Washington 1908, p. 6 *et seq.*

aridity, under the diminished precipitation and the lessening to disappearance of the ameliorating climatic reaction of the once-expanded water areas, was the shrinkage of the loess zones. The grassy steppes, which had once teemed with life and permitted the distribution of ruminants and the horse across all Asia to Europe, gradually became broken up into disconnected areas by the increased intensity of desert conditions. The expanding deserts cut off the connection between the faunae of southern Turkestan and Persia on the one hand and those of Europe on the other, and allowed the evolution of regional varieties. And there must have been a similar reaction upon the distribution of man.

After this, a continued progress towards extreme aridity advanced the desert sea of sands till its dune-waves, rolling even nearer to the mountain, completely submerged long stretches of the narrowed loess-zone between the now restricted deltas at the mouths of mountain streams. The teeming herds of ruminants and horses disappeared over vast areas, and life was restricted to the mountains and to the borders of the few remaining streams and to the deltas.

The phenomena observed in different parts of Turkestan were rightly supposed to have not only local validity, but to have been the same all over Central and High Asia.

It seems only reasonable to suppose that epochs of increased glacial conditions were coincident on both sides of the Trans-Alai range and in neighbouring regions. In the Great Alai Valley and on the Pamir, we have one class of moraines of similar antiquity and extent, another of similar freshness and extent and indications of a third still later class of little extent. Evidence thus places each class on the Pamir as contemporary with its respective similar class in the Great Alai Valley.¹

The uniformity of the terrace phenomena over vast areas supports, according to HUNTINGTON, the hypothesis that they were due to changes of climate. In Persia, Transcaspia, and Russian Turkestan he found that »the terraces of the main valleys leading from the higher mountains present a marked degree of uniformity in structure, arrangement, number, appearance, and relative size«. This was true for the Kwen-lun as well as for the Thian-Shan. »From Persia on the west to China on the east the typical series of terraces consists of three which are old and large and comparatively dissected, two which are much smaller, younger and better preserved, and a still smaller one, often absent, which may be called incipient.« There are sometimes traces of still older terraces.²

We are apt to think of the Glacial period as, primarily, a time of intense glaciation. Such a view is inadequate. Glaciation was a phenomenon whose distribution in space was limited to the northern half of Europe and North America, and to a few elevated regions in other parts of the world. Its distribution in time was limited to the five or more glacial epochs which formed half of the Glacial Period, the other half being composed of interglacial epochs, during which the climate was so far ameliorated that the glaciers retired as far as their present position, or farther. Thus the Glacial period was, primarily, a time

¹ Raphael Pumpelly: *Explorations in Turkestan with an account of the Basin of Eastern Persia and Sistan*. Washington 1905, p. 145.

² Ellsworth Huntington: *The Vale of Kashmir*. *Bulletin of the American Geographical Society*. Vol. XXXVIII, No. 11, 1906, p. 657 *et seq.*

of climatic change. It consisted of alternating epochs of colder or moister climate on the one hand and of warmer or drier climate on the other. In non-glaciated regions one of the most notable features of the colder or moister epochs must have been an increase in the size of rivers analogous to the increase in the size of glaciers in glaciated regions. Hence, such epochs may fitly be termed «fluvial» when we speak of regions where rivers increased in size, just as they are called «glacial» in regions where glaciers increased in size....

Whatever the cause of «fluviation» may have been, it seems safe to say that in non-glaciated regions, such as most of Central and Western Asia, a fluvial epoch was a time of increased humidity, because of either increased precipitation or a diminished evaporation. In either case the size of rivers, springs, and enclosed lakes would increase, and the soil would be more damp than in an interfluvial epoch such as the present. Under such conditions the processes of weathering or rock-decomposition would be more active. Therefore, in places where the underlying rock was not already protected by a thick layer of soil, weathering would proceed rapidly until such a layer was formed. In regions which are now arid this would be especially true. Under conditions of aridity, plants are so scarce that the soil is not held in place, even on very gentle slopes. It is washed away by occasional torrential rains almost as fast as it is formed. Increased humidity would cause an increased growth of vegetation, the roots of which would be effective agents in holding in place the new soil and half-decomposed rock produced by the more rapid weathering.

Proceeding from these great perspectives to a more recent and localised case we may, for a moment, listen to R. D. OLDHAM. Speaking of the Sind valley he says that:

glacial action is excluded, for this lower part is filled, to a depth of some 300 feet, by stream deposits, the greater part consisting of fine-grained alluvium. This has been cut into terraces by the river, and the terraces, like the existing stream bed, are covered by waterworn boulders. It is difficult to believe that a glacier could have flowed over this deposit, nor is there any sign of one having done so, and it is equally inconceivable that this deposit, which is a continuation of the Karewahs of Kashmir, could have been formed and again eroded since the retreat of the glaciers.¹

Higher up signs of glacier action were found.

A part of the village of Gund is built on a great *roche moutonnée*, and the hillside is smoothed and striated for a height of about 500 feet above the bottom of the valley, the glacier having probably reached another hundred feet above this level.

Similar signs were found a couple of miles above Gund. Above Sonamarg and its moraines the valley remains open and straight but no certain signs of glaciation could be seen. He shows the changing glacial phenomena which have taken place with the Sonamarg moraines and the moraines which project into the Gumber valley at Mechoi, as well as the different conditions of different valleys depending upon the relative size of the collecting area, the niveau of the permanent snow-level, the loss of area by cutting back of valleys and, finally, the proportional amount of precipitation.

¹ R. D. Oldham: *Note on the Glaciation and History of the Sind Valley, Kashmir. Records of the Geological Survey of India.* Vol. XXXI. Calcutta 1904, p. 142 *et seq.*

Whatever may be the epoch of the formation of the glaciers he describes, Oldham regards it as,

geologically speaking, extremely recent, and the facts and considerations detailed above show that within the time which has elapsed since that epoch, the Sind river has lengthened its course by 20 miles and added 150 square miles to its drainage area, while the range to the north of it has undergone an elevation of at least 2,500 feet as compared with the valley of Sonamarg, whose drainage formerly flowed through the valley now forming the Zoji-la.

In different summaries CHARLES RABOT, at the same time, discussed the results obtained so far; so for instance in *Exploration des Glaciers du Karakorum*.¹ In his *Glacial Reservoirs and their outbursts* he deals with some special kinds of phenomena. He describes the torrents of mud, in Baltistan called »shwa», which occur in the high valleys of the Western Himalaya and Kara-korum. In many cases the »shwas» are due to the dilution of glacial mud, encumbering the high valleys with the melting from snow and ice, but they are also often produced by glacier outbreaks. Inundations caused by the outflow of glacier lakes are very frequent. Some of the Kara-korum glaciers, as Baltoro, Biafo, Hispar, are the greatest on the earth. The average slope, RABOT gives as 3.5°. The lower limit of the *névés* is accordingly very high, 5,700—5,800 m. (18,696—19,024 feet), according to GUILLARMOD, 1902, on the Baltoro. A vast surface of ice is therefore exposed to fusion and the melting is very rapid, innumerable torrents are formed giving rise to border and surface lakes.²

In 1905 systematical observations on the secular movements of the principal Himalayan glaciers were begun under the control of the Geological Survey Department. Already in August and September, Officers belonging to the Geological Survey were sent to the glacial regions of Kumaon, Lahaul, and Kashmir. H. H. HAYDEN surveyed the Barche, Hinarche, Minapin, Hispar, Yengusta, and the Hasanabad Glaciers, all in the Kashmir region. H. WALKER and E. H. PASCOE examined the Bara Shigri and Sonapani in Lahaul, and P. COTTER and J. C. BROWN surveyed the Pindari Milam, Shan Kulpa, and Poting Glaciers in Kumaon. By plane-table sketches, cairns, photographs, etc. the state of the glaciers and moraines was fixed for the time of the visit. In this way starting points were made for comparative studies in the future. The chief object so far was the secular advance or retreat of the glaciers.³

Examining the reports HOLLAND found that the glaciers of the Hunza valley and the Kara-korum Range generally descend to lower altitudes than those in Lahaul and Kumaon. The former go down to 7,000 or 8,000 feet, the snouts of the latter

¹ *La Géographie*. Tome IX. Paris 1904, p. 374 *et seq.*

² *Geographical Journal*. Vol. XXV, 1905, p. 545.

³ T. H. HOLLAND: *A Preliminary Survey of certain Glaciers in the North-West Himalaya*. By Officers of the Geological Survey of India. *Records of the Geological Survey of India*. Vol. XXXV. Calcutta 1907, p. 123 *et seq.*

melt at about 11,000 feet. In the Hunza region two classes of glaciers were observed: a. glaciers transverse to the trend of the range, being short and steep; b. glaciers lying in troughs parallel to the range. The Hispar is some 25 miles in length, the Biafo, from the opposite side of the same col is 39 miles. The transverse glaciers go down to 8,000, the longitudinal to 10,000 feet.

A general retreat was in nearly all cases shown by old moraines. The Yengutsa and Hasanabad Glaciers were exceptions to the rule.

CHARLES RABOT gives a very good *résumé* of the periodicity in the movements of the Kumdan Glacier, so far as they were known in 1911. He gives the periods of Dr. LONGSTAFF, to which I have been able to add a few dates. Then he says:¹

Ces dates coïncident remarquablement avec celles des variations glaciaires dans les Alpes. — A titre documentaire rappelons que durant ces quinze dernières années une forte crue a été également constaté sur plusieurs autres glaciers dans la partie nord-ouest du Karakoram. De 1892 à 1906 l'Hinarche a éprouvé une remarquable poussée en avant, de même que le Yengutsa en 1901 et l'Hassanabad en 1903. Depuis sur ces deux derniers appareils la progression s'est arrêtée. En 1908 la langue terminale du Yengutsa se trouvait à quelques mètres en arrière du point où elle s'arrêtait deux ans auparavant, tandis que le front de l'Hassanabad n'avait subi aucune modification. Par contre, de 1892 à 1908 l'Hispar est demeuré stationnaire ou du moins n'a reculé que très légèrement; de 1906 à 1908 la régression a été d'une douzaine de mètres, une perte insignifiante pour un appareil dont la longueur atteint 50 kilomètres. — Vers le début du XX^e siècle s'est donc produit dans le Karakoram une augmentation de la glaciation, générale semble-t-il. Avec le Norvège ce massif forme donc une remarquable exception au régime glaciaire dominant dans le reste du monde.

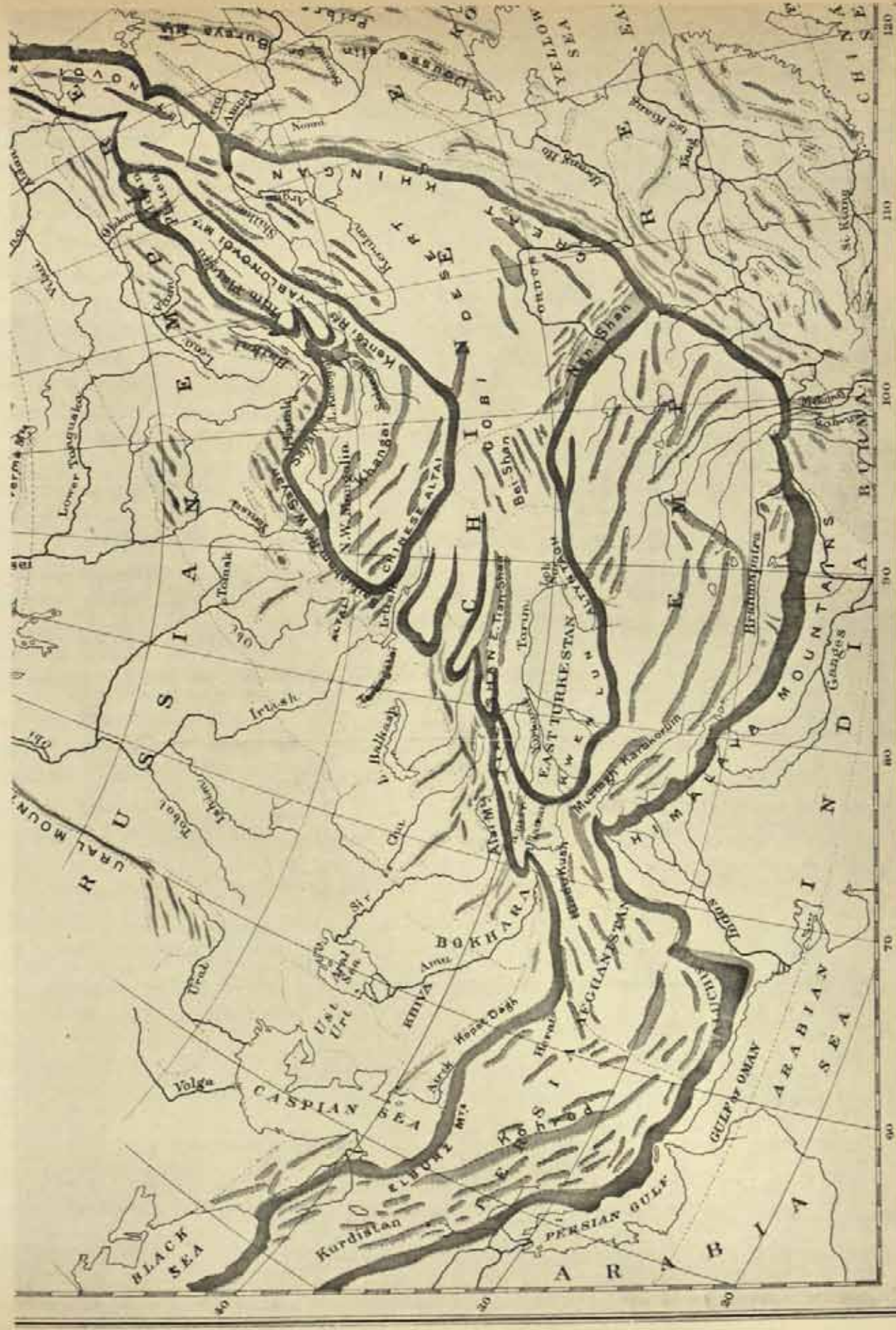
P. 379 *ibidem*, Rabot says: Dans l'ouest des Himalayas, des mouvements de sens divers ont été constatés.

From a geological and orographical point of view Dr. KARL OESTREICH, who as a topographer took part in the WORKMAN'S expedition of 1902, describes his experiences of the N. W. Himalaya. His own journey he calls a geomorphological excursion, though his chief object was the topographical survey of the Chogo Loomba glaciers.² Regarding the relation between the Kashgar Range and the Kara-korum he says:

Wie sich der Mustag-ata zu dem jungen Gneissmassiv von Ladäk-Baltistan, also auch zur Mustagkette verhält, darüber ist mit Sicherheit ein Urteil noch nicht möglich. Aber die Einsicht in die Geschichte der Mustagkette, die wir doch immerhin besitzen, und die Ähnlichkeit der Richtung des Gebirgstreichens in beiden Hochketten, legt uns den Gedanken nahe, im westlichen Kwen-lun ein umgefaltetes, «Himalaya-gewordenes» Kwen-lun-Stück zu sehen.

¹ Charles Rabot: *Résultats géographiques des expéditions du Duc des Abruzzes et du Dr. Longstaff dans le Karakoram. La Géographie. Tome XXIII, 1911, p. 139 et seq.*

² *Die Täler des nordwestlichen Himalaya. Ergänzungsheft N. 155 zu Pet. Mitt. Gotha 1906.*



CLARK STARK, LIT. AGENT, 502

Orographical Map of Asia by P. Krapotkin, 1904.

Oestreich uses the name Transhimalaya and explains his meaning of it in the following words:

Mit diesem in der Literatur sehr verbreiteten Namen sei der Kürze halber die sonst so schwer als einheitlicher Komplex zu fassende Gesamtheit des Gebirgslandes zwischen Kashmir und dem Indus bezeichnet.¹

About the same time Prince P. KRAPOTKIN published his article *The Orography of Asia*, in which he classifies the mountain ranges of the whole interior of the great continent. KRAPOTKIN subdivides his »Great Plateau of East Asia» into 1. The lofty terrace of Tibet, itself subdivided into two terraces and with an appendage in the Pamirs; 2. N. W. Mongolia, continued in the Vitim plateau; and 3. the lower terrace including the Tarim depression and the Gobi.

Entering upon the details of the »Tibet Terrace» he adds:

A series of chains of mountains having their foot on the plateau and separated from each other by high longitudinal valleys, 14,000 to 15,000 feet of altitude, run parallel to the Himalayas, and of these, the Karakoram mountains rise high above the snow-line, their loftiest peak, the Dapsang, being only 300 feet lower than the Gaurisankar.²

The different theories of Krapotkin are of great interest, though sometimes built up rather on his brilliant imagination than on real solid observation. He uses the word plateau, and cannot accept the substitute »peneplain» proposed by American geologists, a view with which I heartily sympathise. His general orographical map reproduced here as Pl. LXX, is interesting so far as it gives the boundaries of the Tibetan Plateau, and he differentiates between the border ranges of the plateau and the chains of mountains having their foot on the plateau, proving that he is familiar with the important part played by the enormous deposits of the interior of Tibet. However, he has not been able to abolish the phantastic range running S. W.—N. E. across the Indo-Chinese rivers and introduced by RICHTHOFEN and SAUNDERS. It is surprising that anybody could believe in its existence still so late as in 1904.

In France the views of DUTREUIL DE RHINS regarding the general orography were still sometimes accepted. L. DE MILLOUÉ writes for instance:³

Le système orographique du Tibet peut être considéré, dans son ensemble général, comme formant deux vastes plateaux séparés par une région sensiblement plus basse et beaucoup moins accidentée. L'un, le plateau du Tibet proprement dit est limité au sud par l'Himalaya, et au nord par une chaîne de moindres hauteurs qui court à peu près parallèle à la courbe qui décrit l'Himalaya. L'autre, que l'on peut appeler le plateau des Nanchan, ou Montagnes du Sud, est délimité par la chaîne des Kouen-loun, au nord, et au sud par une autre chaîne courant du nord-est au sud-ouest, des monts Bayan-kara au Gandi-séri.

¹ Op. cit., p. 48.

² *Geographical Journal*, Vol. XXIII, 1904, p. 176 and 331 et seq.

³ *Bod-youl ou Tibet (le Paradis des moines)*. Paris 1906, p. 14.

July 17th 1906 Mr. CALVERT crossed the frontier to Shipki and proceeded to Gartok *via* the Chumurti Plain. August 20th he set off for the goldfields, and reached Chukang on the Indus by a hitherto unknown route. Thok Jalung he found deserted. He was the first European to reach the place. On the return journey he visited Rudok. I have not been able to find a more detailed description of this most interesting and clever journey.¹

From these general descriptions of the physical and orographical geography of High Asia we have again to direct our attention to a few exploring expeditions in the Kara-korum System.

¹ *Geographical Journal*. Vol. XXVIII, 1906, p. 633.

RECENT EXPLORATION
IN THE
KARA-KORUM GLACIERS

CHAPTER XLVII.

CONWAY.

Only two travellers had visited the regions to which Sir MARTIN CONWAY carried his exploration, namely Colonel GODWIN-AUSTEN and Captain YOUNGHUSBAND. In the service of the Great Trigonometrical Survey of India Godwin-Austen visited the Kara-korum Mountains in 1860—61. He had crossed the Skoro-la, ascended the Baltoro Glacier and the Punmah Glacier to one of the Mus-tagh Passes. He had mounted five miles along the east bank of the Biafo from its snout, descended the Braldo River, went up the Basha valley, reached Nushik-la from the south, returned to Arundo, Shigar and Skardo. Younghusband in 1887 re-opened the disused Mus-tagh Pass, which gives access from the north to the basin of the Baltoro by way of the Piale tributary.

In 1892 Sir MARTIN CONWAY started for our regions, accompanied by M. MCCORMICK, M. ZURBRIGGEN, M. ROUDEBOUSH and Lieutenant C. G. BRUCE. In all he spent 84 days on snow and glacier, and explored in their whole length the three longest known glaciers in the world outside the polar regions. A comparison between Conway's map and the corresponding sheets of the Indian Atlas will show how much new ground he covered.¹

After having explored the Samayar, Barpu and Shallihuru Glaciers he began the most important part of his work, from Hispar toward the east, and accomplished a glacial journey which for ever will be reckoned amongst the classical performances in Asia, — a journey the results of which have hardly since been surpassed. Every one of Conway's successors in this field have had to follow his maps and add detail to them. But Conway had no other map than the one compiled from Godwin-Austen's excellent observations, which, however, were very much misunderstood in the drafting room. From a glaciological point of view Conway was breaking up untrodden ground

¹ *Climbing and Exploration in the Karakorum-Himalayas*. London 1894. — Conway has also published many articles as, for instance: *The Nomenclature of the Karakorum Peaks*. *Proc. Roy. Geogr. Soc.* Vol. XIV. 1892, p. 857.

in the Kara-korums and opening a new era of exploration. In the history of this exploration his name belongs to the most famous.

July 11th, Conway set out on his march over the Hispar Glacier, starting from a height of 10,320 feet. From its frontal moraine the glacier had retired one mile comparatively recently. »Such a small oscillation is of no importance, so that practically the Hispar Glacier may be considered to have been stationary during the historic period, for the cultivated Hispar fan has been deposited since the main retreat of the ice.»¹

At his first camp Conway was at a height of 11,770 feet. The range opposite, at the northern side, culminated in a peak upwards of 24,000 feet. Next day he passed several tributary glaciers and reached a height of 13,070 feet. July 13th he crossed the mouth of the Makorum Glacier, over which there is an easy col to Chogo Lungma. On the northern side is the Churi Glacier which had swollen greatly, although its neighbour, Lak, had shrunk. He explains this from some heavy snowfall having caused a strong development of the Churi, whereas the same effect was not yet noticeable on the Lak, which is much longer.

It had long been known that there was a road over the mountains between Skardo and Nagyr (Nagar). But it had been abandoned for some time. In September 1861 GODWIN-AUSTEN tried to find this Nushik-la road. Major CUNNINGHAM made a similar attempt. Both started from the Shigar valley, ascended to Arundo at the foot of the Chogo Lumba and by the Kero Lumba Glacier went to Nushik-la. Neither of the two Englishmen went down on the northern side to the Haigutum, but returned south. That's why Conway sent BRUCE up from Hopar, west of Hispar, to try from the north. June 30th Bruce arrived at Haigutum. July 3rd he started for the pass. He was told nobody had been over it for 20 years. With its 16,800 feet it proved to be a difficult pass, but Bruce was successful. The glacier had changed its appearance very much since Godwin-Austen's time.

However, July 15th Conway continued up the Hispar. Nushik-la could be seen in the distance and looked difficult. Opposite the Kanibasar Glacier he describes the landscape thus:

a series of snowy peaks, belonging to a range yet further to the north, peeping over a portion of the ridge that bounds the snowfields in that direction. Thus it is in this country — northwards the high mountains seem to have no end. Ridge behind ridge, crest behind crest, glacier behind glacier, they stretch away in monotonous parallelism, through regions uninhabited and even unvisited by man.

The Kanibasar Glacier has a great double »Firnmulde«, shut in by grand peaks. The right side of the Hispar Glacier was much covered with gravel. The height of the camp was 14,110 feet. July 16th he continued on clean ice in the

¹ Op. cit., p. 331.

middle of the glacier. A big nameless glacier comes in from the north. Height of camp: 15,240 feet.

Of the side glaciers he says:

Between Hispar and Haigutum the glacier receives numerous tributaries both from north and south. Above Haigutum the northern tributary glaciers become more numerous and larger, but the Haigutum glacier is the last tributary from the south. The ridge that runs from the Nushik to the Hispar pass, rises in a mighty wall direct from the surface of the glacier

Finally he reaches the Hispar Pass, 17,650 feet, and the Hispar Glacier comes to an end. Suspecting schrunds in front, east, he says: »We remembered how in all parts of this mountain range there had evidently, in recent years, been a vast increase in the store of snow at high levels.« They had heard of the blocking of the Hispar Pass by some change in the glaciers, by which the level of the Snow Lake near the pass may have been raised. They passed the schrunds easily, however, and they had the Biafo Glacier in front of them. The Snow Lake camp was at an absolute height of 16,300 feet. Already the next camp is at 14,230 only. July 20th they followed the medial moraine downwards. Two days later an excursion was made to the mouth of the Latok Glacier.¹

Thus far from the level of the great Snow Lake, the glacier had been broad, even, and of gentle slope. But then it becomes narrower and steeper. The progress becomes more difficult and fatiguing. After an excursion a bit up Biafo he continued, July 25th, amongst growing moraines. A strong stream of water was flowing along the edge of the clear ice before it disappeared in a blue funnel. Conway has many striking and picturesque examples of how a glacier is fed by precipitation, and how rivers are fed from the accumulated snow and ice.

The end of the Biafo opens out into a kind of fan. Formerly the glacier calmly flowed over a mound of rock at its end, but now it must stop behind it, and it is only a feeble arm that is pushed between it and the mountain side.

At Camp Askole the height was 10,360 feet, and at the foot of the ice of the Biafo Glacier, 10,120 feet. Here Conway makes the following comparison:

When Godwin-Austen was here (Korofon, Biafo snout) in 1861 the Biafo glacier abutted against the rocky foot of the mountain mass called Mango (south of, in front of snout), and the Biafo river flowed beneath it. Now the glacier has so far retreated that the river flows in open daylight and has stony plains exposed on either bank, the foot of the glacier being about a quarter of a mile short of its old position. I could discover no clear signs of the ice advancing again, indeed, the contrary seemed rather to be the case. These trifling variations in the length of a huge glacier like the Biafo are, however, of little account. The Biafo glacier is, under any circumstances, small compared with the

¹ Conway published a preliminary article on *The crossing of the Hispar Pass*, *Geogr. Journ.* Vol. I, 1893, p. 131 *et seq.*

mighty system of ice-rivers that once flowed down these valleys. There are visible traces of ancient glaciation all the way up the north slopes of Mango to a height of at least 3000 feet above the present level of the valley. The glacier that made them must have been an affluent of that large ice-river which once drained all the high snow-fields of the south side of the range of mountains we had been visiting, and, reaching as far as Skardo, there deposited the famous hills of moraine by which all travellers are astonished.

The first days of August he crossed the Punmah River, went up the Biaho valley and camped at the snout of the Baltoro Glacier, 11,580 feet. The most advanced snout of this glacier was found to keep steady and there were no signs of an advance. August 5th he went up the glacier. The Baltoro was narrower than Biafo and Hispar. »In many respects it resembled the Hispar more than the Biafo. Like the Hispar it is very stony, broken into vast mounds and pitted with many lakes. It is therefore extremely troublesome to mount, for one cannot go up either of its banks, but must traverse the wearisome surface.»

August 6th the Piale Glacier on the northern side was passed; there was the route up to Younghusband's Mus-tagh Pass, while Godwin-Austen's Mus-tagh Pass was further west over the same crest. At the junction with the Piale the height was 14,120 feet. To the south Masherbrum was visible, 25,676 feet high.

Conway had much rain the whole time, while in the higher regions snow was falling. The snow feeds the glacier, but the rain destroys its tongue and the work of both is the constant supplying of a river.

He followed the northern margin. The region opened out. Often small lakes had formed between the hillside and the ice. There were signs that this glacier had in recent years shrunk slightly. The whole glacier was stone-covered. The height at Pool camp was 14,480 feet. »The great Baltoro Glacier is formed by the union at the west foot of Gusherbrum, of three chief affluents. I named them Godwin-Austen Glacier, Throne Glacier, and Vigne Glacier. The Godwin-Austen Glacier descends from K 2. The Vigne Glacier comes in from the south, and is fed by the snows of the Chogolisa peaks.» Between the two branches of the Throne Glacier is the Golden Throne, 23,600 feet. At the western head of the Younghusband Glacier is the Mustagh Tower.

August 11th, a new set of rocks was passed, »which give a fresh character to the remainder of the ridge, separating the Baltoro and Godwin-Austen Glaciers. They are granites and hard limestones, in colour light grey, buff, and white». He passed a great fan of débris almost wholly composed of pure white limestone. At Fan camp the height was 15,100 feet. Next day's march débris of gneiss, granite and limestone was found.

The following days some fine peaks were seen, amongst them Gusherbrum and K 2. He worked himself up from camp to camp and reached 20,000 feet at the

Upper Plateau camp. He climbed the Pioneer Peak to 22,600 feet. South of the Golden Throne is the Kundus Saddle of which he says:¹

This, however, would not have taken us across the great watershed, but only into the head of the Kondus valley, which, running due south, joins the valley of the Saltoro river, whose waters flow into the Shayok at Kapalu. The Hidden Peak stands upon the watershed, but there is no pass over the main ridge out of the upper basin of the Baltoro glacier, unless there should prove to be one between the Broad peak and K₂; and that I doubt. At the east side of the watershed is the valley of the Oprang river, into which only Younghusband has penetrated. The Oprang river rises in a great glacier descending northwards from the Saltoro pass. I was informed by the natives that there is a pass leading up the southernmost of the main easterly branches of the Kondus valley, and another out of the Khokun valley, both giving access to the Oprang glacier. The Oprang river receives tributaries from the glaciers of the Hidden peak and Gusherbrum as well as from the Broad peak and K₂. It flows at first in a north-westerly direction and then westward till it receives the Sarpolaggo river from the Mus-tagh pass glaciers. There it turns N. W. again till the Af-di-gar stream from the Shimshal pass joins it, after which it makes a great turn and finally flows into the Yarkand river. . . . The face of the Mustagh range towards the Oprang valley would form a magnificent subject for a mountaineer's explorations.

Conway returned on a partly different way over the same great glacier. His Hollow camp at 14,480 feet appeared to have coincided with the highest point reached by Colonel Godwin-Austen in 1861.

Of special interest is Conway's volume: *Maps and Scientific Reports*, being a supplement to the volume about the journey itself. Amongst other things it contains an important article: *Notes on Sir W. M. Conway's Collection of Rock specimens from the Kara-korum-Himalayas by Prof. T. G. Bonney and Miss C. A. Raisin*. A summary is given² of the geographical distribution of the specimens of rock found and collected by Conway, which have to be carefully compared with my collections farther east.

In the Samaiyar valley, below the glacier, were found *in situ* a fine-grained gneiss and granite, and from fallen fragments a schistose dipyr rock, crystalline limestone, a mica schist and a schistose grit. The character of these rocks suggested the possibility that the granite was intrusive in the sedimentaries. On the left bank along the Samaiyar Glacier was found *in situ* a somewhat micaceous gneiss, and on the right a micaceous conglomerate and a fine-grained gneiss. Beyond Hopar were found *in situ* a fine-grained gneiss and a mica-diorite, and as loose specimens along the left side of the Nagyr valley and of the Bualtar Glacier, diorites; on the medial moraine granite was found. Along the Shahlihuru Glacier a fine-grained gneiss, a crushed mica schist, a calcareous mica schist, a limestone breccia, are found all *in*

¹ Op. cit., p. 531.

² P. 71—73.

situ. In a ridge on the right bank of the Barpu Glacier appeared gneiss, limestone and mica diorite.

Along the Hispar Glacier up to the Hispar Pass Conway collected the following specimens: a fine-grained gneiss and a micaceous gneiss, both *in situ* near the snout; granite and micaceous gneiss, at the right side high up the glacier. »Evidently the rocks on either side of this huge ice sheet are crystalline, but an infolded mass of comparatively unaltered sedimentaries must exist somewhere among the peaks to the south.»

Near Snow Lake at the uppermost part of the Biafo Glacier gneissoid granite was found *in situ* and lower down micaceous gneiss. At the foot of the Latok Glacier comes granite. From the valley of the Biaho mica diorite is reported *in situ* and on the ascent to Skoro-La micaceous gneiss was collected. »The specimens indicate that the rocks enclosing the Biafo Glacier correspond generally with those on the west side of the Hispar Pass, and that the belt of sedimentaries, already noted as occurring somewhere among the mountains on the left bank of the Hispar Glacier, possibly is prolonged into those on the right bank of the Biafo Glacier.»

A spur-like range of lofty mountains between the Biaho valley and the one carrying the drainage of the Punmah Glacier contains crystalline dolomite, fine-grained gneiss, crystalline limestone, hornblende schist, fine-grained gneiss and a garnetiferous mica schist, all *in situ*. Near the foot of the Baltoro Glacier comes a granite *in situ* and sandstone from blocks. By the north side of this glacier were granite, fine-grained gneiss and crystalline limestone, all *in situ*. On the south side were granites of which the mountains on the south side of the lower part consist.

From the higher part of the Biafo Glacier the mountains are characterized by needle forms, farther to the east they are more rounded in outline. From Crystal Peak on the right bank of the Baltoro Glacier come fine-grained gneiss, a calcitic quartz schist, a dark mica schist, dolomite and limestone, all *in situ*. On the ascent to the White Fan Pass were collected a mica syenite, a crystalline white dolomite, both *in situ*. A diorite comes from a peak west of the Godwin-Austen Glacier.

The moraines from Gusherbrum give sandstone and earthy limestones, and the right bank of the Throne Glacier phyllite, argillite, limestone, slate and a limestone, breccia, all *in situ*. From the left side, a fine-grained gneiss, a granite, and a dolomite. It was evident that a considerable mass of sedimentary rock must be infolded from Gusherbrum to Golden Throne.

The valley of the Indus from Parkatta to Tolti lies among alternating diorite and granites, and from Hemis to the turn for Lama-yuru among argillite and slate alternating with granite.

The authors come to the following important general conclusion:

Again and again throughout this district of the Karakorams, rocks bear evidence of severe pressure, the result of earth movements. Putting aside those which are either

certainly or probably of igneous origin we find three rather well-marked groups. One, fine-grained, speckled, gneiss . . . ; secondly, crystalline schists, limestones and dolomites, doubtless metamorphosed sedimentaries . . . ; and, thirdly a group of sedimentary rocks With these the peculiar felstones of the Golden Throne appear to be associated, and in one or two places the presence of somewhat altered fragmental rocks is suggested. It seems probable that the history of the Karakoram region is very similar to that of the Alps. First a great floor of crystalline rock, partly igneous partly metamorphic, in the more strict sense of the word, on which was laid down, possibly with interruptions and marked intervening disturbances and denudations, a series of sedimentary rocks. This ended; all were affected by a process of folding on a gigantic scale and upheaved into a mountain mass, which has been carved by the usual agents of denudation into peaks and valleys far surpassing in wildness and grandeur even those of the Alps.

GODWIN-AUSTEN was the first scientifically trained scholar who approached the most inaccessible parts of the High Kara-korums with their gigantic glaciers. Sir MARTIN CONWAY opens the series of modern glaciologists who have, at the present date accomplished a splendid work in one of the most difficult fields of exploration in the world, where still so much is left to be done.¹

¹ Instead of reproducing the glacial maps of every one of the explorers who have made ascents in the Kara-korums, I have preferred to publish a general map of the region in two sheets, drawn by Colonel H. Byström, and printed by Justus Perthes in Gotha. It is inserted in my atlas.

CHAPTER XLVIII.

ECKENSTEIN, GUILLARMOD AND PFANNL. — FERBER AND HONIGMANN.

If we stick to the chronological development of our knowledge of the Karakorum System we have now to remember the expedition described by Dr. J. JACOB GUILLARMOD and in which the following other members took part: O. ECKENSTEIN, who was the leader of the expedition, A. E. CROWLEY, M. G. KNOWLES, PFANNL and WESSELY.¹ During the spring of 1902 the expedition went up to Askole on well-known routes. One of the chief objects of the expedition seems to have been to approach K 2 as near as possible, for since GODWIN-AUSTEN only CONWAY had been near it. When leaving Askole the expedition consisted of six Europeans and 230 men.

On the Braldo River they reached a little plain — »au bout de laquelle on aperçoit la masse imposante de l'extrémité inférieure du glacier de Biafo. La rivière qui s'en échappe ne se jette pas directement dans le Braldoh; elle le suit parallèlement pendant une heure environ, ce qui oblige à gagner le dos du glacier et à s'en servir comme d'un pont naturel». Using CONWAY'S map they went over the snout of the glacier and arrived at Korofon. The following passage reminds us very much of what Conway had observed ten years before.²

Actuellement, ce glacier ne s'étend pas plus loin que le Braldoh, et son extrême limite est marquée par la rive droite de la rivière. Depuis l'époque où les topographes en firent le relevé (1861), il a pu se retirer un peu; mais, comparées à son énorme masse des variations aussi minimes sont sans importance. D'autre part, le glacier est relativement petit, si on le compare aux puissants systèmes de courants glaciaires qui s'écoulaient autrefois par ces vallées. On voit partout des traces d'anciennes glaciations sur les pentes septentrionales du Mango-Gusor, jusqu'à 1000 mètres au moins au-dessus du fond de la vallée.

Instead of going up to the bridge as CONWAY had done, they preferred to cross the river near the principal valley, which took place in the beginning of June when the volume of water is no doubt generally less than in August. GUILLARMOD says that CONWAY gives the distance to Bardumal as being $2\frac{1}{2}$ miles, whereas his

¹ *Six mois dans l'Himalaya, le Karakorum et l'Hindu-Kush*. Neuchâtel 1903 (?).

² *Op. cit.*, p. 148.

own party needed three hours along the river, and he found that Conway's map was «inexacte sur plus d'un point», a statement which may be doubted. So much the more as the quoted distance on Guillaumod's map is also exactly $2\frac{1}{2}$ miles, both measurements starting from the ford of Punmah.

Of the geological observations he says:

Depuis que nous sommes dans le bassin de l'Indus, nous ne voyons que des roches éruptives sous toutes leurs formes: protogine, diorite, serpentine, schistes micacés, gneiss, granits à grains de toutes grosseurs; la route est souvent semée de quantités énormes de grenats, les uns petits, très durs, proéminent sur un fond noirâtre, d'autres atteignant la dimension d'un pouce, enfermés dans une masse micacée du plus beau vert, avec des filets bleu ciel, de sorte que certains rochers offrent l'aspect le plus riant.

The only sedimentary beds they found were the alluvial deposits or the old moraines, the débris of which could be seen up to 1,000 metres above the Braldo giving testimony, the enormous expansion of glaciers in earlier periods to as well as to the erosion which is still going on.

The way to K2 was clearly shown by the Baltoro Glacier the length of which is given as nearly 100 kilometres. June 15th they left Paiyu quite near the snout.

La rivière sort de la base du glacier par une magnifique voûte, précipitant ses eaux boueuses avec une force telle, qu'il serait inutile de songer à la traverser à gué; le seul moyen de passer sur sa rive gauche est d'employer le pont naturel que forme le glacier lui-même.

He estimates the thickness of the glacier at 120 or 150 metres, and twice as much one or two kilometres higher up, at points where lateral glaciers are joined. A comparison between the two maps makes it probable that the snout has not changed visibly during the 10 years. At the mouth of the Liligo Glacier, Conway's little lake was still in existence.

The names of the northern tributary glaciers are not always in agreement with Conway's; Guillaumod says the Baltis were very positive in their statements of names given. Conway has the following glaciers on the northern side, reckoned from the end: 1. Nameless Glacier; 2. Uli Biaho; 3. Dunge; 4. Durni; 5. Piale; 6. Three nameless glaciers; 7. Younghusband Glacier; 8. Godwin-Austen Glacier. Guillaumod has: 1. Uli Biaho; 2. Tramgo; 3. Dunge; 4. Biale; 5. Mustagh; 6. One nameless glacier; 7. Younghusband Glacier and 8. Godwin-Austen Glacier. The Duke of the Abruzzi has also only one between the Mustagh and Younghusband Glaciers.

From Camp III to IV, Lhungka (14,377 feet) they crossed the glacier to the northern side which was followed for the rest of the journey. Camp V, Gore, 4,475 m., was the same as Conway's Storage Camp (14,210 feet = 4,332 m.).

Conway has the following southern tributary glaciers: 1. Liligua; 2. Mundu; 3. Stachi-kyungme. Guillaumod has: 1. Liligo; 2. Mundu; 3. Yermanendu. The Duke has: 1. Mundu; 2. Yermanendu.

Of the Mus-tagh Pass Guillardmod heard:¹

C'est à l'est de cette tour que se trouve le fameux passage du Mustagh . . . ; au dire des indigènes, il est devenu impraticable par suite de l'écroulement d'un pan de montagne qui n'a laissé qu'une paroi infranchissable.

Camp VI, Biange, was at a height of 15,176 feet.

Prof. SUESS had asked PFANNL to look out for limestone »et en général des dépôts sédimentaires des périodes antérieures aux grands soulèvements qui ont fait de la chaîne de l'Himalaya ce qu'elle est actuellement«. It was on the route to Biange that they found an answer to this question, finding very pure marble and ordinary limestone.

Camp VII, Doksam, was at 15,518 feet, a little above Conway's Fan Camp. From this point they touched new ground where Conway had not been. Guillardmod writes Doksam on the map, Doxam in the text, and Doscarn on an illustration which is, by the way perfectly splendid, and represents the Mitre Peak, which he estimates at 7,500 metres. Camp VIII, on the Godwin-Austen Glacier was 16,592 feet (5,057 m.) high. Already from here one could see that Conway's Possible saddle was only a narrow passage between the upper and lower Godwin-Austen Glacier. Camp IX on the southern foot of K₂ was 17,382 feet (5,298 m.) high. Camp X, 18,733 feet (5,710 m.) was situated between K₂ and Broad Peak. The latter he estimates at 8,500 m., or only 111 metres less than K₂ which he also calls Chogori. Camp XI, 20,000 feet (6,100 m.), was at a narrow place on the snow-covered glacier. An attempt to climb K₂, July 10th, was given up at 22,000 feet. Camp XII, west of Staircase Peak, was of the great height of 21,000 feet (6,400 m.) approximately. On the southern slopes of K₂ they found limestone.

Regarding the movement of the glaciers, and the height of the snow limit the following observations were made:²

Tous, sans exception, sont en crue manifeste; leurs moraines frontales sont constamment en mouvement, et il ne se passe pas une minute sans qu'un éboulement ne s'y produise; la masse de glace de leur langue terminale déborde et domine le dos de la moraine, souvent de plus de 20 et 30 mètres, refoulant et décapitant le faite de ces formidables murs de pierre.

La limite inférieure du névé remontait, au commencement d'août, à 5700—5800 mètres sur la branche orientale du glacier de Godwin-Austen . . .

From Camp XII they returned down the glacier.

These extracts may be completed with the following observations of Dr. H. PFANNL who has published two narratives of his experiences on the expedition of OSKAR ECKENSTEIN, so well described by GUILLARMOD. The principal object of the expedition was to definitely determine at what height the rarefaction of the air — above hitherto reached points — made climbing impossible. K₂ (Dapsang or Mount

¹ Op. cit., p. 194.

² Op. cit., p. 338.

Godwin-Austen) was chosen, as Mount Everest for political reasons was inaccessible. Eckenstein, who had accompanied Conway, further believed that K₂ was outside of the Indian precipitation. Finally Eckenstein knew the country from his former visit. Regarding the precipitation Pfannl says:

Alle Niederschläge kommen von Südwesten. Beim Hinaufziehen durch die Täler der Hauptkette, die Kaschmir vom Indusgebiete trennt, werden sie durch die Bergfahrt und auf den ausgedehnten Gletschern derart abgekühlt, dass sie einen grossen Teil ihres Wassergehaltes fallen lassen müssen; sie kommen dann in der verhältnismässig niederen Zone zwischen dieser und der Mustaghkette infolge der eintretenden Erwärmung als sehr trockene Luft in Betracht, um erst beim Auftreffen auf die etwa um 10,000 Fuss höhere und noch weit mehr vergletscherte Mustaghkette wieder so abgekühlt zu werden, dass sie neuerlich Nebel, schwere Wolken und in den Hochlagen massenhaften Neuschnee bilden.¹

On June 5th the expedition left Askole. After a few hours they had reached the snout of the Biafo Glacier which, 200—150 m. thick, and coming from its side valley, blocked the whole main valley. It presses the Braldu to the opposite side, though the river holds its bed open, bounded by the 150 m. high glacier ice. On the third day they reached a green oasis, three quarters of an hour below the Baltoro Glacier. The place was called Paju.

June 9th, Dr. Pfannl and two other members started. Very soon the glacier opens its front before them. At the northern side it is bounded by wild mighty mountains. The party ascended the snout at the glacier gate near the northern side, where the Braldu comes out, and crossed the moraine-covered glacier to the southern side, which they followed for three days. Gigantic moraine walls prove that the ice has reached much higher. The fourth day the glacier was again crossed and the northern side was followed to the seventh day. The eighth day they turned from the Baltoro to the Godwin-Austen Glacier and had a first view of K₂. They were at the height of Mont Blanc, and some 4,000 m. still remained to the top of the K₂. The natives call it Chogo-ri »the Great Mount«. The ninth day they had reached the southern side of K₂.

No electrical phenomena in the atmosphere were observed. The differences of temperature are enormous. One day they observed -25° C early in the morning, and $+38^{\circ}$ C at noon. At the place where Conway supposed a saddle to be situated in K₂ — Broad Peak Ridge — the party reached, on the 10th day, the *Firnbruch* between the two peaks. To the N. N. E. an extensive *Firnbecken* stretches itself. The ridge of K₂ stretches in the same direction. The N. N. E. saddle was called a *Grenzsattel* as in the Alps; its height was 20,550 feet. On its north side a mighty ice-stream was directed to the east. Different excursions were made to examine the

¹ Dr. H. Pfannl, *Eine Belagerung des Tschogo-Ri (K₂) in der Mustaghkette des Hindukusch (8720 m.)*. Zeitschr. d. Deutsch. u. Österreich. Alpenvereins. Jahrg. 1904. Band XXXV. Innsbruck 1904, p. 88 et seq.

possibility of attacking K 2 from the N. E. Dr. WESSELY and Dr. JACOT reached a height of 22,000 feet. On July 12th Dr. PFANNL and Dr. WESSELY made a last attempt from a point on the principal ridge of K 2 and less than six km. from the peak K 2. They had to return on account of Dr. PFANNL'S illness, and the 22,000 feet remained the record of the expedition. A little map of the regions round and N. E. of K 2 is connected with Conway's map.

Regarding the altitudes reached Dr. Pfannl says at another place:¹

Bei diesen Rekognoszierungen erreichte ich einmal 21,350', Dr. Wessely und Jacot 22,000'; schliesslich verlegten Dr. Wessely und ich unser Lager auf 6300 m oben blieb das Wetter schlecht, so dass es zu keiner weiteren Unternehmung kam; haben wir den Rekord mit damals 23,000' nicht gebrochen, so dürfte die Tatsache so langen Aufenthaltes in so bedeutender Höhe wohl wichtiger sein als ein Vorprellen für Stunden oder Minuten über eine zufällige Grenze.

On September 8th 1903, C. F. FERBER and E. HONIGMANN left Srinagar, and took the road of Burji-la (4,850 m.), from where the Mustagh Range became visible in the distance with Mango-Guser, Masherbrum, Mustagh Tower, K 2 and Gusherbrum. From Deosai they travelled down the Indus valley to Skardo and Askole.² The great range Kara-korum—Himalaya separates, according to Ferber, India, and specially Kashmir from the interior of Asia, and has only two practicable passes. Over the eastern one passes the road between Leh and Yarkand, the western one joins Gilgit in Dardistan, *via* the Pamirs, with Kashgar. A third pass is the Mustagh-Pir between Skardo in Baltistan and Yarkand, which for generations has not been used. YOUNGHUSBAND was the last to cross it, 1887.

The road went up the Biafo valley. In his narrative he only gives the names used by the Balti natives, but adds within brackets the names to be found on CONWAY'S map.

He has only noted reliable names, though the reliability is not absolute. Lūmá is valley, paró fireplace. Korofon was the first paró, beyond Bió (Biafo glacier), Bardumal was the second paró. In the evening of the third day they camped a little above Paju, at the foot of the Baltoro Glacier. This was the headquarters. September 26th they began the wandering in the labyrinth of gravel on the Baltoro, the length of which he estimates at about 50 km. The moraines looked old, here and there covered with vegetation. They ascended along the left side of the glacier. Liligo was the fourth paró. All the way to Ordokás they followed the left side. The first side valley to the south or left side was Chober Zechen Luma (Liligua gl.). The first side valley to the north or right side was the (Uli Biaho Luma), the second,

¹ *Von meiner Reise zum K₂ in den Bergen Baltistans. Mitteil. d. K. K. Geogr. Gesell. in Wien.* Band XLVII, 1904, p. 247 *et seq.*

² C. F. Ferber: *Die Erkundung des Mustaghpasses im Karakorum-Himalaya. Zeitschr. des Deutsch. u. Österreich. Alpenvereins.* 1905. Band XXXVI. Innsbruck 1905, p. 113 *et seq.*

opposite the Chober Zechen was the Trahongé Luma (Uli Biaho). Wild rocks, towers, needles, groups are to be seen. The next side valleys to the right were: Talve Luma (Dunge gl.), Piale Luma (Durni gl.), Mustagh Luma (Piale gl.). Chober Zechen was the fifth paró.

September 27th. At the next valley to the left, Chober Zechen Germi Luma the Gusherbrum (8,034 m.) became visible. Then followed Cho Blák Luma. Ordokas was the sixth paró opposite to Piale Luma (Durni gl.). Traces from ECKENSTEIN'S expedition were seen. Now the glacier was crossed to its northern or right side. Mitre Peak and Masherbrum (7,821 m.) became visible. At the foot of the latter was Mundu Luma.

The moraine hills were up to 50 m. high. Blocks of granite, mica, schist and marble are found. Lungka (Camp 14,120) was the seventh paró near the entrance to the Mustagh Luma (Piale gl.). In this valley the eighth paró, Mustagh Spangla, was reached. The valley is nearly filled with the Mustagh Glacier. At the right side the valley is bounded by wild rocks, covered with snow and ice on their northern side. Four glaciers join in the upper reaches of the Mustagh Glacier, of which the uppermost is the Mustagh Pass.

The next day they reached a place with 22 abandoned and ruined huts, and a little higher up a level place, called Schāgārām, where Baltis and Yarkandis were said to have played polo in old days. Still higher up, at Lobsana Blangsa, an eremite had lived. Here the second headquarters were placed. The height was about the same as Mont Blanc. To the south the landscape with Masherbrum and Mundu Glacier was admirable. Fireplaces of three stones, still black, were remains of travellers years ago.

September 29th Lobsana Blangsa was left. The first side glacier from the left was called Snake Glacier. Its S. E. neighbour was called Black Tooth gl. and Black Tooth was the mighty pyramidal rock from which both came. The third glacier, Tower Glacier, comes from Mustagh Tower. From this point the Mustagh valley turns to the west. The rocky mass to the left or south was called Neptune. To the right was the mass called Seven Pagodas. Opposite it is the Snow Cap and between the two the Mustagh Pir glacier comes down. The lowest passage of the Snow Cap is the Mustagh Pass.

Five hours hard struggle against rock, ice and snow brought the two wanderers and one of their guides to the top of the Mustagh Pass — im Herzen des Kara-korum Gebirges und auf der Wasserscheide zwischen Indus und dem Tarimbecken. YOUNG-HUSBAND had obviously conquered the lowest part of the pass, and FERBER expresses his admiration for this great achievement of a man who had no experience in glacier wandering. The height was 5,800 m., Mustagh Circus 5,575 m., Lobsana Blangsa, 4,860 m., Lungka 4,510 m., Ordokas 4,225 m., Baltoro Camp 3,530 m., Askole 3,160 m., Skardu 2,350 m.

From the »Firnmulde» of the pass the fall of the Pir Glacier is very steep, while to the Chinese side the ice-filled valley has a gentle slope. The view in the latter direction was obstructed by a dark mountain massif. Of the New Mustagh Pass, which was said to exist to the west and to lead to the Punmah Glacier, nothing could be seen, and the Baltis knew only one pass of the famous name Mustagh. The plan of continuing the next days to Chang tok on the Chinese side could not be realized.¹

¹ The same article: *An Exploration of the Mustagh Pass in the Karakorum Himalayas*, is printed in the *Geogr. Journal*, Vol. XXX, 1907, p. 630—643, accompanied by a sketch-map of the Baltoro glacier and a special map of the Mustagh valley.

CHAPTER XLIX.

MR. AND MRS. WORKMAN.

Of great importance for the knowledge of this world of icy mountains are the several journeys undertaken by Dr. HUNTER WORKMAN and Mrs. BULLOCK WORKMAN. In 1898 and 1899 they visited parts of the High Kara-korum which had been explored by Sir MARTIN CONWAY, and they had made some new ascents. Their experiences were published in different Journals, amongst others in the *Annuaire du Club Alpin Français*, 27^e Année, 1900, Paris 1901, p. 320, under the title *Dans les neiges du Baltistan*, accompanied by a little map of the route and of the whole length of the Biafo Glacier. In 1902 and 1903 they explored the unknown upper portions of the Chogo Lungma, Hoh Lumba, Sos Bon and Alchori Glaciers.¹ Of the Dras and Indus valleys Dr. Workman says:

Not only near the present level of the rivers, but at all elevations, even to the mountain-tops several thousand feet above, the granite rocks are smoothed, rounded, eroded in every conceivable manner and dented with pot-holes, showing that at some distant period they were subjected to the action of moving water carrying stones.

From Skardo they went up the Shigar and Basha Rivers to Arundo near the snout of the Chogo Lungma Glacier. South of Arundo the Tippur Glacier »formerly reached considerably farther down the valley than now«. The Chogo Lungma is 9,500 feet high at Arundo, 30 miles long, one mile broad at the lower end, two miles at the upper. The lowest part of the glacier, for 9 miles, was full of detritus, but no end-moraine was accumulated. A good-sized river flows out from under it and joins the river from the Kero Lungma Glacier to the north.

Of interest are the comparisons they made with GODWIN-AUSTEN'S observations in 1862. Since then the Chogo Lungma had dwindled greatly. Godwin-Austen found the ice encroaching on the Arundo terrace. »Now it nowhere touches it, and has receded to a point 1184 feet west of the village.... A quarter of a mile above the end the side of the snout has receded more than 200 feet from the high right

¹ *From Srinagar to the sources of the Chogo Lungma glacier. Geographical Journal. March 1905. Vol. XXV, p. 245 et seq.*

lateral moraine.» Six parallel front moraines showed that the glacier has been receding since a long time back. Evidence was found that the ice must have been 150 to 200 feet thicker than now. At one place at the side of a lateral moraine the action was livelier in 1903 than in 1902. Six medial moraines were seen. The Haramosh Glacier is the largest branch of the Chogo Lungma.

»The Chogo Lungma Riffelhorn» mainly consists of granite with a wide band of black slaty rock superimposed. The medial moraines contain granite. Mount Haramosh is given as 24,270 feet high, and just north of it is a pass, 17,412 feet, leading to the Indus. The col of the Chogo Lungma Glacier is nearly 20,000 feet high. On its other side the mountain slopes down to Nagar. The Chogo Lungma Glacier is formed by several branches.

Colonel GODWIN-AUSTEN said after this paper:

The portion of the Indus valley, from the junction of the Dras river down to Skardo, is a wonderful gorge. You see there the action of former glaciation and beds of gravel and sand at an enormous height above the present level of the rivers; in fact, the glacial scenery you have been looking at this evening is only the remnant of the great glaciers that once filled those valleys.

About the end of the Arandu Glacier he added:

It is evident, from the photographs shown us this evening, and from Dr. Workman's description of it that it has very much changed in the forty years since I was there. I have brought up with me a water-colour sketch of the end of the glacier, which I made in the year 1861. It shows quite a different outline from what it is at present. Again, the north bank of the glacier all the way up shows it has receded very much from the side of the mountain from what it was in 1861. At that time it abutted against the mountain-sides the whole way down, cutting off the drainage of the side valleys and formed a series of small lakes, all of which have disappeared since that time.

On the same occasion Colonel WAHAB pointed out that detailed surveys of the higher Himalaya had never been regarded as within the scope of the Indian Survey, and that, while so much work of importance elsewhere remained undone, it is not to be expected that they should. Mr. DOUGLAS FRESHFIELD believed that the absence or rarity of great terminal moraines might best be accounted for by the action of floods in carrying away all but the heaviest blocks. To his paper Dr. WORKMAN adds a good map of the region from the Haramosh Glacier in the west to the Hispar and Biafo Glaciers in the east.

As an appendix to this lecture Mrs. WORKMAN a year later published *First Exploration of the Hoh Lumba and Sosbon glaciers*.¹ From the junction of the Braldoh and Basha Rivers they went up the narrow valley of Hoh, filled by old glacial débris. GODWIN-AUSTEN had seen the glacier from a distance but the Workman party was the first to ascend it. Its length is 12 miles, its greatest width one mile.

¹ *Geographical Journal*. February 1906. Vol. XXVII, p. 129 *et seq.*

»It seems to have retreated somewhat rapidly of late years.» In June the velocity of the Hoh Lumba Glacier was found to be a quarter of a foot in 24 hours. Its inclination was $2^{\circ}32'$. The surrounding peaks are of granite. Mount Sosbon is gneissoid.

About the Kara-korum watershed on the south side of the Hispar Glacier she says:

In our last two expeditions we have, I might say, attacked it repeatedly, partly because the cols and passes culminating the glaciers we were investigating found their source in it, and partly because we had a hobby for finding a new pass, over which a caravan could be taken to Hispar. I am now of the opinion that the only available coolie route from either side is the Nushik La.

The Hispar Pass is given 17,475 feet and the Alchori Col 17,622 feet. At the head of the Chogo Lungma is the »Pertab Sing La» 19,800 feet; »above this is a fairly good route to Nagar».

The following observation is of interest.

We have thus either climbed or thoroughly examined eight depressions in the mountains forming the south border of the Hispar, and found them with one exception inaccessible from the Hispar or north side. These observations show very fully that in this region of the Kara-korum, the northern slopes are more precipitous and less accessible than the southern.

The Haramosh Glacier rises 3,400 feet in $11\frac{1}{2}$ miles. The Upper Chogo rises 5,000 feet in 9 miles. The Basin Glacier is one of the upper feeders of the Chogo Lungma and forms a beautiful icefall at the junction with the latter. At the head of the Basin Glacier they climbed a col, 19,260 feet high, which they called Bhayakara Col. The Moraine Glacier is another feeder from the Serac Col, 17,091 feet.¹ About the Tippur Glacier the following observation should be noted.

It has evidently been advancing for several if not many years, for it has built entirely around the part outside the gorge a high and massive terminal moraine, above which the ice towers from fifty to a hundred feet, and against which it crowds, overhanging it in many places. At the extreme end and at one other point the ice has broken over its moraine barrier, and a line of séracs projects half-way down the side of the latter.

The moraine is 415 feet above the village. The glacier is adding to it rapidly, and is at present in an aggressive mood. Formerly it reached considerably farther down the valley than now.

The Chogo Lungma is at 1,184 feet from Arundo; it rises from 9,500 feet to 19,000 at the base of the col and is 30 miles long. Its lower section is covered with »mud, sand, granite, conglomerate, and shaly detritus» of all sizes; it has no terminal moraine worth mentioning. The glacier has been receding since GODWIN-AUSTEN saw the ice encroaching on the Arundo terrace, which it did not touch in 1902.

»A quarter of a mile above the end the side of the tongue has receded more than two hundred feet from the high right lateral moraine.» Other signs prove that

¹ *Ice-bound Heights of the Mustagh.* London 1908.

the shrinkage has been going on for a long time, and that there have been periods of arrest in this process when the glacier was stationary or slightly advancing, and that the glacier is still retreating.

The middle section of the Chogo has six medial moraines, but its upper part is poor in *débris*. It has 14 glacial branches, of which the southern are not receding. The northern branches are cut off.

In 1899 the Workmans had found much more water on the Biafo than they now found on the Chogo. But the latter has a stronger gradient and rises to a 3,000 feet higher level than the Biafo. They suppose that such water as does result from the sun's heat assists in converting the soft snow into *névé* and true glacial ice. The snow-line varied between 16,000 and 17,500 feet. Much of the snow they found was new from the repeated summer monsoon-storms.

Twelve specimens of rock were brought from the Chogo Lungma region, and it is a pity that the exact place where each specimen was found is not given. They are:

1. Granular crystalline limestone with grains of dark green augite («coccilite») and veins of quartz and yellow epidote.
2. and 3. Granular crystalline white dolomites; resemble marble, contain much carbonate of magnesia.
4. Hornblende schist.
5. and 6. Garnetiferous mica schists.
7. and 8. Hornblende granulites.
9. Quartz and chlorite.
10. Grey limestone and green actinolite.
11. Granular crystalline limestone with green chlorite.
12. Hornfels with concretion, produced by the action of hot intrusions of granite *etc.*

In the *nala* of the Hoh Lumba they found that it was filled with old glacial *débris* several hundred feet deep containing many boulders large and small, through which the torrent has cut its way. The terminal moraine of this glacier was the largest they had seen. All *débris* seemed to be heaped here, whereas almost nothing was left for lateral moraines. The tongue of the glacier had evidently been retreating probably for centuries.¹ Having climbed the glacier, June 21st:

It was easy to see that the glacier has receded not only in length, as shown by the hillock and the moraines behind it, but also in width, as the moraine itself most conclusively testifies. Its top is fifty feet or more above the present height of the ice, which also has shrunk a considerable distance away from it.

The recession seems to have been periodical. On the survey map only one glacier was marked here. They found there were two, Sosbon being the other.

¹ Op. cit., p. 203.

They ascended the Sosbon Glacier to its col, 17,000 feet; north of it is the Cornice Glacier which has a col to the Biafo Glacier, and is separated from the Hispar Glacier by an unbroken granite wall.

In the middle of August 1903 they climbed the Pyramid Peak to a height of 23,394 feet.

The Pyramid-peak was entirely snow-bound, its apex being formed by a pointed, sharply-defined cornice, which soared into the deep-blue sky like the curling crest of a mighty wave about to break. Directly beneath the cornice is a tremendous precipice, while on its east side the mountain falls in another precipice some 7000 feet to Basin glacier below. This is a type of many high Karakoram peaks which end in similar cornices pointing towards the north, and usually overhanging abrupt precipices.... The direction in which they point is due to the prevalence of south and south-west winds.

Of the Kero Lungma Glacier they observed that it had »evidently diminished greatly in size in recent times». Such was also the case with the Hucho Alchori.

Almost all glaciers visited by the Workmans showed evident signs of retreat in recent years. A few more examples of the phenomenon may be given. They found it to be no uncommon occurrence that glaciers might recede from considerable distances without leaving behind debris of any size. Such an example was given by the Chogo Lungma which retreated 1,184 feet in 42 years, leaving a smooth river-bed below it.¹ About the Shafat Glacier in the Nun Kun, on the other hand, it is said: »The valley-bed immediately in front of it, though somewhat strewn with small stones, bears no terminal moraine to indicate that the glacier has in recent times extended lower down than at present....» The ZI Glacier of the same group had no terminal moraine in 1906, and had been receding constantly and rather rapidly for some time.²

The journey described in the book just quoted began April 1906 from Srinagar, and was the fifth trip of the Workmans. They now made a Himalayan snow and glacier group the object of their researches. Passing Suru and crossing the Suru River they camped at the foot of the Shafat Glacier 13,350 feet high, from where they attacked the Nun Kun group. The Shafat Glacier was ascended, and Camp Italia was situated 20,632 feet high on the Nun-Kun Plateau at the N. E. foot of the highest Nun-Kun peak or Ser, 23,447 feet. Camp America on the same snow plateau was at 21,300 feet, and was believed to be the highest point at which mountaineers had passed a night. The Pinnacle Peak, 23,300 feet high, was ascended. The Fariabad Glacier was found to end suddenly at the edge of the ZI Glacier. The Chogo Lungma had, as mentioned above, retreated 1,184 feet in 42 years. Going down the two last-mentioned glaciers they again ascended to the North-West Glacier. The North-West Col had an altitude of 17,397 feet.

¹ W. HUNTER WORKMAN: *An exploration of the Nun Kun Mountain group and its glaciers. Geographical Journal.* January 1908. Vol. XXXI, p. 35.

² *Peaks and Glaciers of Nun Kun*, London 1909, p. 117.

In the *Alpine Journal* of Febr. 1903 Dr. A. NEVE calls the Barmal Glacier the great Western Glacier of Nun Kun. In his *Tourist's Guide* to Kashmir 1908, p. 122 the same author says that Mr. BARTON and he, in 1902 discovered that the Bhot Kol Glacier comes all the way from the Nun Kun Peak. In the *Alpine Journal*, Febr. 1905, p. 250 he speaks of the Barmal Glacier as »the upper Bhot Kol Glacier», and in May 1908 he says the Barmal Glacier runs due west and joins the Bhot Kol. The Workmans, however, found that the two glaciers are independent of each other, and that the Ganri Glacier comes in between the highest part of the Nun Kun and the upper part of the Barmal Glacier.

After some more ascents they crossed the Sentik La, 16,500 feet, and Sentik Glacier, and finally returned to Suru. A good map is added to this as to earlier narratives of the indefatigable American mountaineers. The photographs illustrating the text are very instructive.

Regarding the snout of the Hasanabad Glacier different statements have been given. In the Records of the Geological Survey of India Dr. H. H. HAYDEN said he had been informed by the natives of an advance of several miles in $2\frac{1}{2}$ months. He visited the snout in 1906. Two years later the same place was visited by Dr. WORKMAN and proved not to have changed since Hayden's visit. He says the form of this glacier makes it very sensitive, for the reservoir is very big and the glacier narrow and short. The strong advance seemed to have taken place on account of the stormy seasons of 1902 and 1903. In 1903 Dr. Workman »noticed a similar advance of a large branch of the Chogo Lungma descending sharply from the snowy Haramosh Mountains, which crowded the Chogo Lungma trunk bodily over for a considerable distance against its left lateral moraines, from which, in 1902, it stood well removed».¹

In the summer of 1908 the Workmans went up to the village of Hispar. South of this village is the Yengutsa Glacier, which in 1906 had been examined by Dr. HAYDEN. He heard from the natives that in 1901 the glacier had suddenly advanced with great rapidity a distance calculated by Hayden, from CONWAY'S map, of two miles.²

The Hispar Glacier was found to have shrunk 30 feet in two years. The WORKMANS ascended the Haigatum Glaciers to the neighbourhood of Nushik-la, which from the Kero-lungma had been visited in 1861 by GODWIN-AUSTEN. Dr. NEVE had tried it in 1896 from the same side but returned. The Workmans went up to the Biafo-Hispar Watershed Peak, 21,351 feet, and to the Hispar Pass, 17,500 feet, from where the slope goes down to the Biafo Glacier. They also ascended

¹ *The tongue of the Hasanabad Glacier in 1908. Geographical Journal. August 1910. Vol. XXXVI, p. 194.*

² *The Hispar Glacier. Geographical Journal. February 1910. Vol. XXXV, p. 105 et seq.*

some of the side glaciers, especially those from the north. We do not need to enter upon their experiences on this glacier which has been so well described before.

In a fuller account published later on they enter more thoroughly upon a description of the famous Nushik-la, which for so long a time had been regarded as affording a passage between Baltistan and Nagar *via* the Kero Lungma.¹ The natives were said to have taken even animals over it in former days. But so far as is known within memory of living man, only BRUCE and ECKENSTEIN of CONWAY'S expedition in 1892 had been able to cross it. Major CUNNINGHAM had reached the summit of the pass, following GODWIN-AUSTEN'S track. In 1896 Dr. A. NEVE had been unable to get over it. The WORKMANS got a good view of the Nushik-la from a peak east of it which they called Triple Cornice Peak, 19,000 feet high. They conclude:² »By our examination of the Nushik La from the opposite ridge, from the glacier of its base, and from the heights above it, as well as by our ascent of Triple Cornice Peak, we think we . . . are justified in saying that, until great change for the better occurs, it cannot be regarded as a passage available for travellers' and explorers' caravans.» The difficulty of the pass lies only on the Haigatum side, for the descent to the Kero Lungma is easy. They quote some changes which have taken place within their own experiences and mention also what is known about the Mus-tagh Pass. The Nushik-la seems to belong to those difficult places which may have been easier in former times, although little or nothing is known of the causes which dictate such changes.

They also climbed the »Biafo Hispar Watershed Peak» which »may truly be said to include in its vista of sixty miles east and west a panorama of superlative grandeur of one of the most magnificent mountain-landscapes in the world». Its height was placed at 21,350 feet. The summit of the Hispar Pass was 17,500; CONWAY has 17,650 feet.

¹ *The Call of the Snowy Hispar*. London 1910, p. 62 *et seq.* This work is accompanied by a map of the Hispar Glacier, and an Appendix by Count Dr. CESARE CALCIATI and Dr. MATHIAS KONCZA.

² *Op. cit.*, p. 81.

CHAPTER L.

T. G. LONGSTAFF AND ARTHUR NEVE.

To the most valuable expeditions in the glacier world of the High Kara-korums belongs that undertaken in 1909 by Dr. T. G. LONGSTAFF together with Dr. ARTHUR NEVE and Lieut. A. M. SLINGSBY. About the objects of this journey Longstaff says:

»Between Younghusband's Muztagh Pass and the Karakoram pass on the Leh-Yarkand trade-route, a distance of 100 miles as the crow flies, we have no record of any passage across the main axis of elevation having ever been effected by an European. There are, however, traditions relating to an old route known as the Saltoro Pass, and it was the elucidation of this latter problem at which I aimed last year.»¹

He mentions an area amongst these mountains roughly measuring a degree in each direction, into which no traveller had ever penetrated and which never had been surveyed. It is situated east of 77° E. and north of $35^{\circ} 30'$ N. and it is bounded to the south by the labours of the G. T. S., to the east by the headwaters of the Yarkand River, explored by HAYWARD, to the north by Raskam, and to the west by YOUNGHUSBAND'S discoveries around the glacier sources of the Oprang River in 1889. In 1835 VIGNE had attempted to find the Saltoro Pass, of which he had heard from the natives. He went 5 miles up the Saltoro or Bilafond Glacier. In 1848 HENRY STRACHEY went 2 miles up the Siachen Glacier from which the Nubra River takes its rise. It was this *terra incognita* that Longstaff made his goal, and where he and his party made important conquests for the knowledge of the physical geography of the Kara-korum.

It would take us too far to follow their wanderings step by step. I will only make a few extracts from LONGSTAFF'S narrative.

It was reported that the Saltoro Pass route had been abandoned as soon as the Kara-korum Pass route was rendered safe by the intervention of the British Raj. But Longstaff could not accept this explanation as the desuetude into which many

¹ *Glacier Exploration in the Eastern Karakoram. Geographical Journal. June 1910. Vol. XXXV, p. 622 et seq.*

glacier passes in these high regions have fallen in recent times is too frequent an occurrence. He is rather looking for changes in the glaciers themselves, although not necessarily an advance or increase of the ice. For in another region he had previously seen an example of how the recession of a glacier might in particular circumstances close a route, for instance when a secondary glacier by its recession gave cause to rock-falls which had not occurred at a time when it joined a main icestream.¹ In 1848 THOMSON was unable to find anyone having crossed the Saltoro Pass.

In June 1909 Longstaff went up the Saltoro River. Opposite Paro sheer spires of granite rise to a height of 5,000 feet. »The rocks on the north side of the valley appear to consist exclusively of granites, but the high splintered crest on the south is of slate.« Through the Ghyari nala he turned towards the Saltoro Pass. Three glaciers on the right side of the nala were all found to be actively advancing. The natives asserted that this had been going on for ten or twelve years. »As the snouts are approximately in the position shown on the G. T. S. map (1861), it is evident that there has also been at least one period of local retreat since that date.«

The snout of the Bilafond Glacier was found at a height of 12,400 feet. This glacier had been joined by the Chumik Glacier about fifteen years ago. »Comparison with the old survey indicates an advance of about 2 miles of the combined trunk stream.« The moraines of the glacier, and so far as he could see the two confining ridges, consist entirely of granite.

The Saltoro Pass was found to be 18,200 feet high. The upper portion of the Siachen Glacier was believed to be a glacier of which the coolies said that it would lead eventually to Chang-tang, by which Longstaff concluded they meant the country north of the Kara-korum Pass; and he christened this supposed new glacier the Teram Glacier. Later on he became aware of the mistake.

Four or five medial moraines were seen; those on the right half of the glacier appeared to consist entirely of granite, which was in accordance with the character of that range of the Kara-korum across which they had passed. From the moraines of the left half specimens of hornblende schist, mica schist, dark slate and marble were obtained.

The Teram Kangri Peak proved to be one of the mountain giants on the earth, supposed to be approximately 27,610 feet high.²

The end of June they went up the Chumik Glacier around which the rocks also consisted of granite. The snout of the Rgyong Glacier was found about a mile below the point marked on the Survey, and the glacier had all the characteristics

¹ *A mountaineering Expedition to the Himalaya of Garhwal. Geographical Journal. April 1908. Vol. XXXI, p. 382.*

² *Vide infra.*

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of active advance. The Rgyong-la also was granite. The right bank of the Chulungcañon was granite and the left was of slaty schists. At one place phyllite underlies the prevalent granites. From Gharkun granite walls are again reported.

Beside the Pastan stream, a tributary to the Shayok, the following petrographic observations were made:

The commonest rocks represented are hornblende and other granites, but I also found conglomerate, calcareous schists, quartz, with chrysocolla, calcite with a little malachite, and red jasper. The bed rock forming the sides of the nala turned out to be metamorphic, a highly silicious greenish limestone.

Granite trenches prevailed in the Saltoro region. Regarding the formation of the valleys he expresses the following opinion:

It is evident that the valleys of the Nubra and the Shyok, like the Indus valley, are tectonic. Drew observes that the rocks on the east side of the Nubra are of light brown granite, while those on the west are of a different and much darker crystalline rock. Glaciers have left their marks in these valleys, but the rivers were antecedent. —

Approaching the Nubra-Shayok junction relatively recent moraine stuff with perched blocks were continually passed. The rocks were polished and scratched for hundreds of feet above the river.

The striæ showed that the glacier had swung round the corner into the Shyok valley without any alteration of level, just as the river does now. This more than confirms Drew's surmise that the great Nubra glacier must have extended as far as the Shyok valley.

Of the Nubra river near Charasa he says:

Its very size might have led us to expect that the Siachen glacier was much larger than is shown on the Survey map. For though the Nubra river has a course of only 45 miles, and receives no tributaries of any importance, the water was sweeping down with a very rapid current through numerous channels covering about a mile in width, and in some of these with a minimum depth of over 4 feet.

This is a very good illustration of how a river is born in these high regions, and it should be remembered by those who make the Tsangpo rise in the longitudinal valley, while it comes from and is fed by mighty glaciers.

Longstaff mentions the earlier visitors in the upper Nubra valley. MOORCROFT visited it in 1821, VIGNE about 1835, THOMSON and HENRY STRACHEY in 1848; DREW gave an excellent description of it, and so did HERMANN SCHLAGINTWEIT.

Having received letters from YOUNGHUSBAND and BURRARD assuring him that it must have been some upper head of the Siachen which he had called the Terem Glacier, Longstaff decided to solve this problem, instead of carrying out his original plan upon the Kara-korum Pass. The Terem proved indeed to be identical with the upper Siachen Glacier. The snout of the Siachen was at 11,600 feet: the official *Gazetteer* of Ladak gave 11,700. »If these two figures are accurate, they would represent an advance of the ice since 1862«. The right moraines of the Siachen consisted of grey granite, the left of black schists with slate, limestones and

various marbles. With its length of 45 miles the Siachen Glacier seems to be the largest in Asia. He regards the Siachen as the complement of the Baltoro just as the Biafo Glacier may be regarded as the complement of the Hispar. It is the merit of Longstaff to have laid down the outlines of the Siachen Glacier and to have joined it to the labyrinth of glaciers previously known in these regions. That it had escaped detection for so long was due to the difficulties of access, difficulties which nobody had been able to overcome before.

In the following words Longstaff mentions some of his most important results:

Whatever the real height of Teram Kangri may be, my observations fulfil Burrard's remarkable prophecy while Younghusband's views as to the northward extension of the Indo-Turkestan water-parting have been definitely established. H. R. H. The Duke of the Abruzzi has made the startling discovery that Conway's Broad peak attains an altitude of 27,132 feet. Also that both this peak and the four Gusherbrums are composed of marbles and conglomerates. The massif of Teram Kangri is a continuation of this range; its base appears to consist of schists and slates, and its peaks of marbles and calcites. There are indications that the same formation occurs in the Nubra-Shyok peaks; certainly the high peaks in the range south of the Dapsang plains, which continues south-eastwards for an unknown distance some few miles back from the left bank of the Shyok river, consist chiefly of calcite. It would, therefore, appear that at least half of the main line of elevation of the Karakoram, the second highest range in the world, must be coincident with an axis of limestone.

Regarding Dr. Longstaff's views of the name and extension of the Kara-korum I wrote in 1910 the following:¹

The paper of Dr. Longstaff has the title, *«Glacier Exploration in the Eastern Karakoram»*, and the same title, *«Eastern Karakoram»* is given to the map. I do not mind Karakoram being written as one word, although Kara Koram should be more correct, as we write Hindu Kush, Kwen Lun, Arka Tagh, or Kichik Kumdan. I write Kara-korum. But the term Eastern Karakoram for the part of the system situated between 76½° and 78° I regard as perfectly wrong. Colonel Burrard says, The Karakoram and Hindu Kush ranges of mountains are different sections of the same crustal fold... The eastern portion of the fold is known as the Karakoram range, the western portion as the Hindu Kush.... The western termination of the Karakoram is the Hindu Kush, but of its eastern termination we know nothing.²

During my last expedition I crossed Chang-lung-yogma (18,960 feet), which is on the Kara-korum at 79°, and from where the system can be seen stretching south-east as far as the eye reaches. The whole orography of the country proves that this pass is situated in the Kara-korum range. South-east of Aru-tso I went over a pass at an altitude of 18,550 feet, of which I am pretty certain that it is situated on the same crustal fold as the Kara-korum Pass and the Chang-lung-yogma, that is to say, the system can be followed to 83°. On the other hand, it is only conjecture when I say that I believe the Kara-korum Range continues through the whole of Tibet, almost as distinctly as Kwen-lun and the other great systems. And I believe that a more detailed knowledge in the future

¹ *Geographical Journal*. August 1910, p. 192.

² *A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet*, pp. 98, 99.

will prove that Abbé Huc's famous Tang-la Range is the eastern continuation of the Kara-korum. Already in 1905 I was convinced of this, as can be seen on Plate 69, Vol. IV of my *Scientific Results*, although I then made the mistake to place the range to the north of the Aru-tso. On Colonel Burrard's frontispiece map the Kara-korum is sketched through the whole of Tibet, although I believe its central and eastern part has been placed a little too far to the south. But this does not at all interfere with the matter in question, as the definite knowledge we already have of the Kara-korum is sufficient for calling the part of the system which is situated between the Hindu Kush in the west, and the British frontier in the east, the Western Kara-korum, and from there further to the south-east and east, the Eastern Kara-korum. Under no conditions should the part between $76\frac{1}{2}^{\circ}$ and 78° be called the Eastern Kara-korum, and in this I am sure Colonel Burrard will agree with me, as I agree with him that the name Muztagh (Mus-tagh) for the western-most part of the Kara-korum Range has to disappear for ever.

The little sketch-map given by Dr. Longstaff on p. 625 of the *Geographical Journal* is very interesting and sheds new light upon a most important orographical problem. So far as I can see, the range with the Kara-korum Pass, the Teram Kangri, the Gusherbrum, and the Mus-tagh Pass, that is to say, the Kara-korum Range *par préférence*, is the continental watershed between Lop-nor and the Arabian Sea. From this range the Shayok River, with its tributaries, as well as the Shigur River, etc., begin and break in transverse valleys (Durchgangstäler) through the southern range. Of this range Dr. Arthur Neve wrote to me some time ago: »It may be interesting to mention that, in my opinion, the old names Mustagh or Karakorum range apply only to the northern range of the British Indian frontier, *i. e.* from the Karakorum to the Mustagh Pass, and that there is a southern range, represented by the Saser peaks, Saltoro Pass, K 10—11, Masherbrum, and the range south of the Baltoro, Biafo, and Hispar Glaciers. Following your lead, I propose Trans-Shayok as a name for this range, for lack of a better.»

From Longstaff's description, I quite agree with him when he says that »the source of the Shyok is really the Remo Glacier, and not a small rivulet visible from near the foot of the Karakorum Pass».

When I passed the mouth of that valley, I could not see where the principal branch of the Shayok river came from, as everything, the ice, the bottom of the valley, and the mountain slopes, disappeared under deep snow. I therefore only marked the opening of the Remo valley on my map. Sometimes it may be difficult to decide which branch of a river is to be called the source; but in this case there is not the least doubt that the Remo glacier is the source of the Shayok. It has the same hydrographical situation as in the case of the Brahmaputra, where the western-most glacier in the Kubi-gangri is the source, and not any one of the rivers coming from Tamlung-la, or Marium-la, although their absolute altitude is higher than the front of the Brahmaputra glacier.

Longstaff gives 18,110 feet as the height of the Kara-korum Pass, which is decidedly too low. I found 18,560, and Colonel BURRARD has adopted the height of 18,550 feet.

Speaking of *Dr. Longstaff's Expedition to the Karakoram*, the *Alpine Journal* said:

The Karakoram range has always been shown upon maps as a great unbroken wall stretching eastwards from the peak of K₂ (28,250 ft.), and forming the water-parting between

the Indian and the Central Asian systems of drainage. For a hundred miles east of K₂ there is no pass over this range known to the natives, and when Dr. Longstaff set out to explore the region last spring his aim was to cross the Karakoram range by a pass named the Saltoro, the existence of which was based upon tradition only, and the position of which was doubtful.¹

Then we are told of the discovery of the old Saltoro Pass (18,200 feet).

On the further side an immense glacier was seen turning south, piercing the main Kara-korum Range, and being an important feeder of the Indus. The Upper Indus was therefore found not to be limited by the Kara-korum Range. The glacier was about 48 miles long, 10 miles longer than the Biafo which so far had been regarded as the largest of the Kara-korum.

The perpetual solitude of these high glacial valleys is brought home to us when we reflect that the greatest glacier outside polar regions had not been seen by living man till Dr. Longstaff's party reached it, and that though it has been for centuries one of the main sources of our river Indus, it has been unknown to geography till 1909.

Finally we are told about the sensational discovery of an immense chain of mountains situated to the north of this glacier, »a chain that is not shown upon any map«. Its highest peak visible was measured from three places by Longstaff, »and its height appears to be between 27,500 and 28,000 feet. This height is only surpassed by four known peaks. No mountain exceeding 27,000 feet in altitude has been discovered since 1858, and the elevations of the only mountains hitherto found to surpass 27,000 feet were all brought to light by the scientific operations of the Great Trigonometrical Survey. Dr. Longstaff has named the newly discovered peak Teram-Kangri. Here, therefore, a discovery had been made that exceeded everything in the way of records in altitude for 51 years.

In the same periodical Dr. Longstaff had an article on *The Saltoro Pass*.

He regards the Kara-korum Range as a very unpromising field for mountaineers. Pioneer Peak was the highest actual summit which had been gained. What he calls the »eastern section of the Karakoram«, was, however, very little known. He says:²

East of the Baltoro basin the main water-parting of the Karakoram has never been attained, much less crossed, by any European, until the Karakoram Pass itself is reached. In this region there is still an area of some three or four thousand square miles which has never been entered by any European and the mapping of which is still quite conjectural. Native report and tradition, however, indicate the former existence of a passage in this direction from Baltistan to Yarkand known as the Saltoro Pass, and it was to find this that I set myself in the summer of 1909.

He mentions the travellers who have approached »this almost Arctic wilderness of mountains»: VIGNE 1835, HENRY STRACHEY 1848, HAYWARD 1868, YOUNG-HUSBAND 1889.

¹ *Alpine Journal*. February 1910. Vol. XXV, p. 38 *et seq.*

² *Alpine Journal*. May 1911, p. 485 *et seq.*

June 15th, 1909 LONGSTAFF, NEVE and SLINGSBY crossed the Saltoro Pass (18,200 feet) and »what was supposed to be the main divide of the eastern Karakoram». On the farther side they found the greatest glacier they had ever seen.

Together with Captain OLIVER, Longstaff, next September, proved that this glacier was merely the upper portion of the Siachen Glacier. Its full length was about 45 miles. The chain of very lofty peaks north of it constitutes »the true water-parting between India and Central Asia. Geological indications point to their direct continuity with the Gusherbrum chain, which has been shown by the Duke of the Abruzzi's expedition to consist largely of various forms of limestone». From the crest of Rgyong La (18,700 feet), 30 miles to the south, Longstaff, on July 2nd realised the great elevation of this new group of peaks. »The observed altitude (of Teram-Kangri) will be 27,610 feet. This value has therefore been adopted for the present.»

July 12th the Saltoro Range was crossed from north to south by an entirely new pass, the Chulung La (18,300 ft.).¹

On a photograph by SELLA (June 22nd, 1909) showed to the S. E. a lofty dominating snow peak, which Longstaff recognized as the peak he had photographed from the south and called Teram Kangri. The observations of the Italians compared with those of Longstaff again worked out a height of »just over 27,000 feet». »But it must be quite obvious that my results are merely tentative and are in sad need of confirmation by some properly qualified surveyors.»

On his map, *Explorations in the Eastern Karakoram*, he has entered 27,610 feet for Teram Kangri. His own heights are red on the map, and determined »from clinometer, Watkin aneroid, and hypsometrical observations». As the height of the new-conquered giant was given within ten feet, it seemed to be very nearly correct.

The altitude, however, by scientific observation proved to be exaggerated.

V. W. B. COLLINS in 1911 was able to take many observations of the Teram Kangri and surrounding peaks with his theodolite.² The station, called Ningstet after the nearest village, was at 18,750 feet. He had made similar observations from the Wusak station. The combined observations gave 26,422 feet. Then he marched up the Nubra to Strongstet, the northern-most village on the left bank of that river. From this third station Strongstet, new observations were taken to the Teram Kangri. As the three angles of the triangle formed by the three stations amounted to some degrees in excess of 180° he returned to Ningstet, which led to the necessary

¹ Cf. *Geographical Journal*. Vol. XXXV. June 1910, p. 632.

² T. G. Longstaff: *Mr. Collins' Triangulation of Teram Kangri*. *Alpine Journal*. August 1912. Vol. XXVI, p. 307 *et seq.* — Cf. *Geogr. Journal*. Vol. XXXIX, p. 71.

corrections. »This change in the position of the peak alters the value of the height of the peak as given above, reducing it about 2,000 ft.» A fourth station was chosen near the village of Tiggur. »I now had Teram Kangri from four places and considered this quite sufficient for fixing its position and height without any margin for doubt.» The stations of observation had been corrected with the existing triangulation, *viz.*, MONTGOMERIE'S Indus series. COLLINS made a splendid work and gained his result after admirable perseverance.

Longstaff adds: »The computations are not quite complete yet, but for the present, the highest peak of Teram Kangri is given as 24,489 ft. and the position as Lat. $35^{\circ} 34' 37'' 31$, Long. $77^{\circ} 07' 31'' 08$, about four miles S. and two miles E. of where I placed it and 3,000 ft. lower. There appears to be no doubt that Mr. Collins has correctly identified the peak shown as Teram Kangri on my sketch map. The serious error in the altitude which I attributed to this peak perhaps arose from a mistake in identifying the true summit from the eastern end of my base-line....¹

In the same season Dr. C. CALCIATI got 24,793 feet for the highest peak. In 1912 Mr. GRANT PETERKIN gave it 24,510 feet. An error of 3,100 feet on a peak the height of which has been determined from clinometer, aneroid and hypsometrical observations, is too much.

Already in 1905 Dr. LONGSTAFF had given a fine example of the indomitable perseverance with which he later on at several occasions attacked the mountain giants of Himalaya and Kara-korum. I have mentioned before² his journey together with CHARLES A. SHERRING. On that occasion he made an attempt to climb Gurla-mandata, which he has described in Sherring's book and in the *Alpine Journal*.³

He started from Takla-kot on July 18th with two BROCHEREL brothers from Courmayeur, with whom he had been climbing in Kumaon. The chief object of the Gurla-expedition seems to have been to »improve on the record of 24,000 ft. established by Mr. Graham» on Kabru more than 20 years earlier.⁴ However Longstaff's Hick's boiling point thermometer was not reliable, as it July 22nd, indicated an altitude of 25,400, an »absurd result, for the summit of Gurla is only 25,350 ft. above sea-level by triangulation». The party climbed from the west, but took a wrong ridge, was stopped by a deep chasm with a glacier and had to return. The next spur to the north was tried. The bivouac of July 22nd »was a very high one: on comparison with the peak 22,200 ft. of the survey, I should estimate our altitude at about

¹ Cf. *Geogr. Journ.* Vol. XXXV, p. 632.

² *Vide supra.* Vol. II, p. 136 *et seq.*

³ *Western Tibet and the British Borderland.* London 1906, p. 213 *et seq.*, and *Six Months' Wandering in the Himalaya.* *Alpine Journal.* August 1906. Vol. XXIII, p. 202 *et seq.*

⁴ In 1883 W. W. GRAHAM reached an elevation of 23,500 feet on the Kabru. In his paper: *Travel and ascents in the Himalaya*, it is said that he »reached the lower summit of Kabru, at least 23,700 feet above sea». *Proceedings Royal Geographical Society.* Vol. VI, 1884, p. 429 and 593.

20,000 ft.». July 23rd: »At two o'clock we reached a point at least 23,000 ft. above sea-level». If they had continued they would have been forced to spend a night »on the exposed ridge probably at an altitude of 24,000 ft.», so they decided to descend the southern slope of a ridge, which, for a thousand feet, was performed on an avalanche. July 24th they had to descend several rock gullies before they could walk up the glacier. The bivouac this night, on the upper part of the glacier, was at an altitude which in their opinion was over 23,000 ft. And he adds: »It is interesting to note that this is in any case the highest spot at which any one has ever attempted to pass the night.»¹

During the night of July 25th, they continued and were stopped by a crevasse at an altitude, »which may have been over 24,000 ft.». Their vertical distance from the top he estimates of 1,500 ft., so the edge of the crevasse cannot have been over 24,000, as the height of the Gurla is 25,350 ft. He says:² »It really does not matter what the exact altitude was». But it would have been of value to know of what kind of rock the highest mountain in Tibet is built. STRACHEY gave us some very interesting communications from as near as he was able to approach the Gurlamandata. And I approached the mountain in the mouths of two of its northern valleys, as has been related in Vol. II, p. 157.

Dr. Longstaff is right in giving the highest praise to the STRACHEYS' map, illustrating their journey of 1846, 1848 and 1849.³ He says⁴ that this map gives a more correct representation of the Gurla group than that contained in the latest sheets of the G. Trig. Survey transfrontier series. »The huge southern glacier does not exist as shown in the latter. This locality lies well to the south of Major Ryder's recent survey; in fact, we were the first to see this side of the mountain, though the northern glaciers are plainly visible from the neighbourhood of Mansarowar Lake.»

I cannot judge in this matter as I have never been to the southern side of Gurla. The map of the Stracheys, mentioned above, has two glaciers on the southern side of Gurla. My preliminary map⁵ relied for these parts on RYDER'S map, and therefore a huge glacier is entered. This will have to disappear if the STRACHEYS' and

¹ In *Alpine Journal*, August 1906, where the same story is told, the author reminds us of the act that: »in 1864 W. H. Johnson when surveying in Ladak was compelled to pass a night at 22,600 ft.» It is hard to see how Johnson was beaten, as Dr. Longstaff had no instruments to fix his heights. If mountain-climbing shall have any scientific value at all, it is more important to be provided with good instruments than with guides from Switzerland. And if, as in this case, the instruments have been smashed a month earlier, one should desist from climbing. But it is indeed interesting to note that in the modern hunt for records there seems now to have been added a competition about who has slept at the highest altitude.

² *Alpine Journal*. 1906, p. 224.

³ *Geographical Journal*. Vol. XV, 1900, p. 204.

⁴ *Geographical Journal*. Vol. XXIX, 1907, p. 206.

⁵ *Transhimalaya*. Vol. II.

the G. T. S.'s maps prove to be wrong. I do not, however, feel convinced by Dr. LONGSTAFF'S statement, especially after comparing his two maps: the one in SHERRING'S book, and the one in the *Alpine Journal*. One would hardly believe that they are meant to represent the same region. Judging from his maps, it is not clear where he touched the southern side of Gurla. For from Takla-kot he went straight north and then ascended the two east-west stretching ridges, which seem to start from the point of culmination. The view must be very extensive from the highest point reached, but glaciers may be hidden behind ridges and in deep-cut valleys. When he says: »in fact, we were the first to see this side of the mountain», he seems to have forgotten Mr. T. W. WEBBER, Colonel EDMUND SMYTH, HENRY HODGSON and the Hon. ROBERT DRUMMOND, who, exactly 40 years earlier, travelled close along the southern side of Gurla on their way from Takla-kot to the east and over the Dak Eo Pass. For, on Webber's map,¹ their route is only 9 miles straight south from the highest summit of Gurla. Three years later Dr. Longstaff, however, remembered Webber's expedition,² for he says: »Thence (from Taklakar) they crossed the lofty Dak Eo Pass to the south of Gurla Mandhata, a route seldom traversed even by natives». I should never have referred to Webber's map if Dr. Longstaff had not exhibited an almost unlimited confidence in it.

At some places³ he criticises the Survey of India, but he does it »in no critical mood». We must remember that exploring and surveying are two different things, and the Survey's trigonometrical observations on the Gurla are of greater value than Dr. Longstaff's geological, glaciological and hypsometrical observations on the same mountain. The surveyors adhere to mathematical and geometrical matters and they have no occasion to pay attention to the physical phenomena of the earth's crust. A triangulation may be scrupulously conscientious, every mountain peak may have its absolutely correct height and position on the map, and still the country between the peaks may be next to *terra incognita* — from the point of view of physical science. But the one cannot do without the other. The map of triangulated peaks will be a lifeless net of coordinates if an explanation of the topographical detail is not given. The surveyor is not trained for that sort of thing, while the student of physical geography will be hopelessly lost if he has not the assistance and the framework given by the trained surveyors. The survey of the whole of the Himalaya and Western Kara-korum is a most brilliant work and no official Survey of any state in the world can be compared with and none has had greater difficulties to overcome than the Survey of India. The means at the disposal of the Survey have not

¹ *Forests of Upper India*. Vide Vol. II, Pl. XVII, *supra*.

² *Geographical Journal*. Vol. XXXIII, 1909, p. 426.

³ *Geographical Journal*. Vol. XXIX, loc. cit.

always been sufficient for carrying out detailed work in every one of the upper valleys of the Himalayas. But in the course of years every detail will be filled up. As it is, the work of the Survey is gigantic and admirable.

It is of great interest to hear that the Gurla Glacier »shows signs of actual recession at the present time». ¹ This was in 1905 and was in perfect harmony with the fact that the channel between the lakes was dry, although, of course, the recession of glaciers begins later than the drying up of river beds. The Manasarovar could easily again overflow whilst the glaciers of the surrounding mountains were still in recession. On the other hand it is not quite in harmony with the retreat of the Gurla Glaciers that some passes in Garhwal, which, according to Bhotia tradition, long ago were easy to pass, now are crossed only with great difficulty. ²

Dr. Longstaff comes to the following conclusion:

Such cases may be due merely to local changes in these particular glaciers, but one cannot help remembering the evidence brought forward by Blanford, Garwood, and others to the effect that the Himalayas are still undergoing a process of elevation. Such elevation, by arresting an increasing amount of the monsoon water-vapour, would surely be at least a contributory cause in the desiccation now taking place in Central Asia, indications of which are evident even in regions so close to the Himalaya as Mansarowar. ³

I have touched upon this problem in a work which was published during my last absence in Tibet, and I will here content myself with quoting the following passage about my own views; ⁴ speaking of the general desiccation of Tibetan lakes I say:

Can it be that it is dependent upon a still active elevation of the geologically recent ranges of the Himalaya, or, as Dr. Ekholm suggests, upon the encroachments which the peripheral regions are making upon the central regions? That the Himalayan waterdivide is advancing from the Indian side towards the Tibetan is certain; but considering the amount of the precipitation, this change can hardly produce any other effect except that of diminishing to some extent the supplies yielded up to the Indus and the Tsangpo, without on the other hand influencing the amount of the precipitation in the interior, self-contained drainage-basins. It is more probable that the desiccation of the Tibetan lakes is dependent upon more comprehensive climatic alterations, possibly of a periodic character and affecting perhaps the whole of the Asiatic continent.

It is of course absurd to make the mountain-building forces in the earth's crust responsible for the greater difficulty in passing the passes in Garhwal at the present time than two or three hundred years ago. The denudation works fairly parallel

¹ *Ibidem*, p. 207.

² *Ibidem*, p. 210.

³ *Ibidem*, p. 211.

⁴ *Scientific Results of a Journey in Central Asia, 1899—1902*. Vol. IV: *Central and West Tibet*, p. 597.

with the upbuilding, especially at high altitudes, which, as mentioned before, induces Professor PENCK to discuss the existence of an »upper denudation limit», above which no mountains are supposed to rise. That the Gurla Glacier retreats at the same time that the Garhwal passes are more snow-covered than formerly, depends upon local causes. The channel of Manasarovar is a useful control. When it is dry very likely the surrounding glaciers soon will begin to retreat. But the information that the Garhwal passes now are more difficult than in earlier days, cannot be used for scientific purposes. The change may simply depend on a deterioration of the natives in the surrounding regions, and a decline of the enterprising spirit.

CHAPTER LI.

ARTHUR NEVE.

In the history of exploration in the High Kara-korum, the name of Dr. ARTHUR NEVE occupies a very high position, and the value and importance of his personal contributions to our knowledge of these mountains cannot be overrated. His death some time ago was a great loss both to humanity and science, and never a more noble and unselfish man has trodden the ice deserts of the Kara-korum. Some thirty-six years he had passed in Kashmir, and he knew the country better than anyother European. In this connection I will only mention a few of his most important observations.

In his *Picturesque Kashmir* and else-where, Dr. Neve had suggested that in the Himalayas a period of glacial advance had set in. In 1906 cataclysms took place in the Upper Shayok and the Gilgit River, both due to glaciers blocking high valleys. At Nanga Parbat and in Hunza he found complete evidence of glacial increase. In 1887 Neve sketched the snout of the Tarshing Glacier of Nanga Parbat and found that it had advanced since DREW'S visit 15 years earlier. In 1906 this glacier and other Rupal glaciers were far more prominent than in 1887. In the Hunza-Nagyr group the advance was quite unique. The Shimshal valley was blocked, and the flood wave rose some thirty feet above the ordinary level at Tushot bridge. The Mutzazil Glacier had, since 1903, advanced five or six miles. Fifty or sixty years earlier the glacier had been almost as low as in 1906.¹

In an article: *Journeys in the Himalayas and some factors of Himalayan Erosion*,² which was read at the Royal Geographical Society in May 1911, Dr. Arthur Neve describes his first Kara-korum trip, in 1896, the object of which was to examine the Saser peaks and to ascend one of them.

Our highest point, 21,000 feet, which we called Panamik peak, was cut off from the Saser peaks, 25,170 and 24,590 feet, by the upper glaciers of the Chamshing, which bend round and form a very large remarkable snow basin to the south-west of those three great giants.

¹ Dr. Arthur Neve: *Rapid Glacial Advance in the Hindu Kush. Alpine Journal.* Febr. 1907. Vol. XXIII, p. 400.

² *Geographical Journal.* Vol. XXXVIII, 1911, p. 345 *et seq.*

The view he got from Panamik peak towards the north, amongst other things the Murgisthang Glacier, induced him, in 1908, to continue his exploration. His intention to ascend the Siachen and try to get around to the Saltoro was frustrated by the rivers. In company with Captain OLIVER, he therefore decided to investigate the Murgisthang Glacier which seemed a possible route to the main ridge of the Kara-korum. To begin with, the Monzthang Glacier was explored. To the N. E. the pale-pink granite cliffs of K₃₂ were seen, the highest peak being 24,690 feet high. Proceeding north to the »middle glacier» they saw to the north and west many lofty peaks of 23,000 feet or more, most of them not yet triangulated.

One peak he felt able to identify as the Teram Kangri. »But what our view chiefly established was that the large glacier basins near us to the north belonged to the upper Shyok system, probably to the Remo glacier, which must therefore be of great size, over 20 miles in length.» Much remains to explore at the sources of the Shayok. He mistrusts the map of this region, including the alignment of the water-parting west of the Kara-korum Pass. And he believes in the existence of some very high peaks east of the Teram Kangri. While the Baltoro Glacier is very well known, the great glaciers of the Hushé and the Konduz are nearly unknown. The water-parting is not even approximately mapped and there may be a pass to the north at the head of the Sher-pi-gan. On the north side of the Saltoro Pass there is much unknown country. He thinks it probable that a pass to the Oprang valley may be found at the upper Siachen Glacier.¹

In his article *The Ranges of the Kara-koram* Dr. Neve has given a brilliant and, so far as I can see, perfectly correct description of the principal features and of the frame-work and skeleton of the western part of the Kara-korum System.² Whilst other mountaineers have directed their attention to certain glaciers with their surroundings of peaks and ridges, or simply have been hunting for records in absolute heights, Dr. Neve has done his very best to penetrate this very complicated orography, which, if compared with the Alps, is so little known.

He regards as the most striking new fact that the glacier which feeds the Nubra River is some 45 miles in length, and lies in a geotectonic trough, with a very lofty range to its north in which there are peaks over 25,000 feet high, amongst which Teram Kangri has »probably over 27,000 feet». Between the Baltoro and Siachen is still a *terra incognita*. These two and Biafo and Hispar, all four lie »almost in a line stretching from Nubra to Hunza, a distance of nearly 200 miles». Another parallelism is the Shimshal Glacier lying in a line with the Oprang valley, »of which the upper portion is in a direct line with the upper Siachen glacier».

¹ I had the pleasure to say a few words after the paper. Cf. *Geogr. Journal*, loc. cit., p. 356 *et seq.*

² *Geographical Journal*. November 1910. Vol. XXXVI, p. 571 *et seq.*

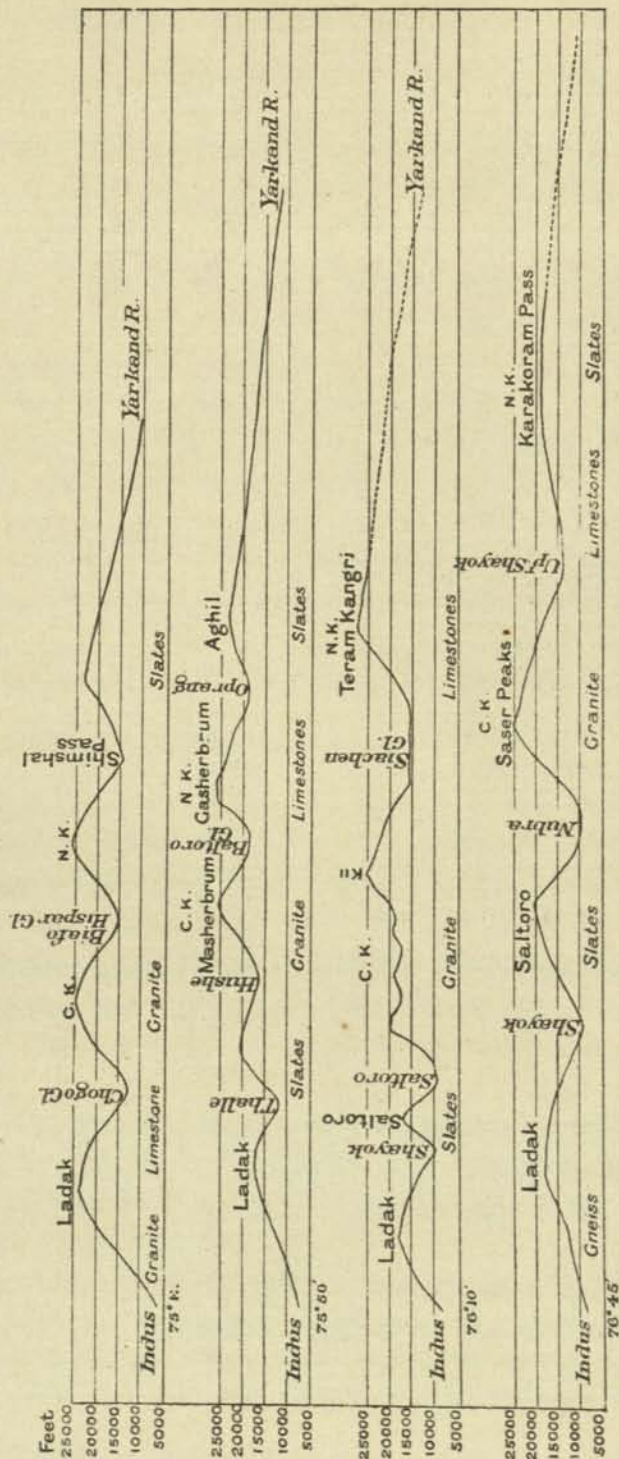
North of this is the great trough of the Yarkand River, bounded by the Kwen-lun mountains. »To the south are the flanking valleys of the Saltoro Husha, representing a minor trough; then the Shayok and the Indus, the upper portion of which from Skardo is in a line with the Shigar, Basha, and Chogo Longmo. These valleys correspond to recognizable mountain folds.»

Dr. Neve takes a section to the N. E. from a point $76^{\circ} 10' \text{ E.}$, 35° N. , and finds that it first cuts the Ladak Range, then a lower range between the Shayok River and the Saltoro, after which comes a massif of granite mountains, through which the main streams cut their way in very deep narrow gorges. Formerly this range has been regarded as the water-parting of the Indus, although beyond it is situated the broad trough of the Siachen Glacier and then the great ridge with Teram Kangri; finally comes the basin of the Yarkand River. Therefore, on this line Neve recognizes four definite crustal folds emphasized by structural differences.

The northern-most of these is the true Kara-korum, and, correctly quoting my view, Neve makes it continue beyond the Kara-korum Pass far to the east into Tibet. Westwards from Teram Kangri it passes »Younghusband's Saddle» and Gasherbrum, between the Siachen Glacier and the upper part of the Oprang valley. Farther N. W. it proceeds to K2 and the Mustagh Pass and continues between the Biafo and Hispar Glaciers to the south and the Shimshal to the north. Still farther on the snowy range continues to Yasin and finally sweeps around to the S. W.

Dr. Neve does not find it improbable that YOUNGHUSBAND'S Arghil Range may stand in a stratigraphical relation with the Shimshal-Mintaka section of the Northern Kara-korum. The central range of the Kara-korum is chiefly granite and was probably raised before the Northern Kara-korum, which is chiefly limestone. In the Changchenmo and Dapsang, LYDEKKER has a considerable area of carboniferous and Jurassic limestones. Neve supposes this is the same belt that can be traced across the head of the Remo Glacier to Teram Kangri. The expedition of the DUKE OF THE ABRUZZI showed that Gasherbrum and Hidden Peak are limestone. »There are then stratigraphical as well as orographical grounds for differentiating the northern Karakorum from the great central granite mass», which extends from the Saser Peaks to Hunza. »This great mass is of considerable width, as well as of great height.» The Saser group is 50 miles wide. About Nubra-Rgyong-Siachen the granite is 30 miles wide. The Masherbrum, after which BURRARD calls the central Kara-korum the Masherbrum Range, is also granite, 30 miles wide. This range is cut through by some of the great rivers. »At $78^{\circ} 15' \text{ E.}$ it is marked off by the sharp angle of the Shayok river, beyond which it may be traced to the north of the Pangory lake, where it becomes the Kailas range.»¹

¹ *Cp.* Burrard and Hayden below.



LADAK RANGE, SALTORO, CENTRAL KARAKORAM, NORTH KARAKORAM.
Gneiss Slates etc Granite Slates, Limestones.

DIAGRAM OF SECTIONS FROM S.W. TO N.E. THROUGH THE FOUR RANGES

BY ARTHUR NEVE F.R.C.S.E.

Neve's sections through the Kara-Korum System 1910.

The Kondus gorge is even more striking, its portals guarded by the Saltoro spires, vast, smooth-faced granite slabs rising sheer 10,000 feet from the river at Dumsum (junction with Saltoro R.) and culminating in stupendous pinnacles and peaks from 21,000 to 23,000 feet high.

The next great gap in the range is at the gorge of the Baltoro river below Askole, beyond which on the south of the Biafo-Hispar glacier the mountains again attain great heights at Rakaposhi near Gilgit. But while the crest line preserves a great altitude from the Nubra to the Baltoro valley, the minor valleys cut the wide lofty granite mass into blocks containing very many peaks, literally scores, over 20,000 feet high, few of which have been trigonometrically fixed.

The third fold is small if compared with the rest. It stretches north of the Shayok, from the Nubra junction and right on across the mouth of the Hushe to the Thalle-la. »It is of palæozoic rocks, schists and slates, vari-coloured, with some trap.« He suggests that it be called the Saltoro Range.

The forth range or fold in the series is the Ladak Range. Of the two mightiest ranges in this system, the northern one probably crosses the whole of Tibet, and the Tang-la of HUC may be its continuation, whereas the southern, the Masherbrum Range, may find its continuation in the Transhimalaya. But as I have pointed out before, there is a great gap in our knowledge, and only when this gap in Western Tibet is filled and the geology well known, will the problem be solved.

At any rate the time is gone when the Kara-korum could be spoken of as »a range«, for it is no more a range than Transhimalaya. So, for instance, it is not quite correct to say as does Dr. ERNEST F. NEVE:¹ »The valley of the Shigar River leads up to the great mountain wall which is known as the Karakorum or Mustagh range and which divides Chinese Turkestan from Kashmir Territory.«

Dr. ARTHUR NEVE illustrates his article with a diagram of sections from S. W. to N. E. through the four ranges reproduced here as PL. LXXI. It shows the four ranges, of which the three north-eastern constitute the Kara-korum System, and the one farthest N. E. carries the Kara-korum Pass, which has given its famous name to the whole system. We will have to return to this important diagram at the end of this volume.

Some seven years ago Dr. Arthur Neve published a book on the wonderful experiences of his life.² It is full of interesting geographical and geological problems, and of valuable observation. I must limit myself to only a few quotations.

Of the deep-cut Indus valley he says:

The Indus Valley from Bunji to Chikas is one of barren desolation combined with a terrific grandeur scarcely to be matched elsewhere in the world. Vast as is this chasm flowing between ranges which rise above it for 15,000 feet on one side and 23,000 feet on the other, there is no need to invoke the agency of huge earthquakes or to suppose that

¹ *Beyond the Pir Panjal*. London 1912, p. 209.

² *Thirty years in Kashmir*. London 1913.

this is in a geological sense a rift through the mountains. It is a valley of erosion, and the eroding force is the great Indus, whose vast chocolate-coloured flood is swollen by the melting snows and glaciers of the Hindu Kush, the Mustagh, and the Karakorum, as well as of the North-West Himalaya, draining nearly 80,000 miles of mountains.

From the village of Panimik he climbed a peak which he called Panimik Peak. He describes how he

looked at the great ice bound giants that rose so impressively sheer from the glaciers, just as some lofty, cliff-girt island stands out from the stormy ocean. We were awe-stricken as we gazed. The nearest peak was also the highest; it rises to over 25,000 feet, and is somewhat table-topped, with lofty ice cliffs at the summit overhanging the precipitous sides. The other peaks, each over 24,000 feet, were quite separate, and lay farther away, and to the east and south-east.

These great peaks may be regarded as the east continuation of the Karakorum range, which extends from here to the north-west, culminating in the lofty peak known as K₂, or Mount Godwin-Austen, and beyond that blends with the Hindu Kush. — The only pass at present practicable in this range is the Saser Pass, from Nubra to the Shayok Valley.

The people of Nubra had mentioned an old tradition that Kanjutis had once raided their valley from the north-west, from some pass at the head of the glacier marked Saichar; and I thought it probable that there might be some direct route to the Oprang, and thence to Hunza, whence the raiders came.

In Skardo Dr. Neve asked a native chief about the route to Yarkand, and got the answer:

»Formerly there was a road to Yarkand for trading purposes, and even horses could go.» — »Why did the trade cease? Is it that the ice has closed the path?» — »No; it was the Kanjutis (the robber bands of Hunza) who raided the caravans at Jangal. On one occasion, forty years ago, the Nagar men raided the upper part of the Shigar Valley, but when they were returning with their plunder, they lost their way on the Biafo glacier and all perished in the snow; since then we have had peace.»

His companion on the 1907 expedition was Captain OLIVER, then British Joint-Commissioner of Ladak.

He is in charge of the trade route all the way from the Sind Valley to the crest of the Karakorum Pass, nearly 400 miles. It is a route that has been used from time immemorial. Rock inscriptions show that it was used centuries before the Christian era. Chinese armies have swept over it, and for centuries the Chinese held fortified posts along it. Indian conquerors have defied climatic difficulties and established colonies on the north side, in the basin of the Tarim.

They travelled up the Nubra Valley, arrived at Panimik, went up the Kaweit Valley. They passed the dark gorge which leads up to the Saser Pass. Gonpa was their farthest camp.

Shelma, the Crystal Peak, flashed up there in the sunlight. Mr. Collins, of the Survey, did some very excellent climbing in 1911 on Shelma and other peaks, in order to triangulate Teram Kangri. A little higher up stood »a sheer wall of syenite, thousands of feet high. They could see »the magnificent snow crest of K₁₂ to the north-west.... I had no dream then of the magnificent size of the Siachen, the greatest glacier in Asia.

In the autumn the natives take their goats up the valley one march beyond the snout of the glacier.

Beyond that, they said natives had penetrated two more marches, and that there was a connection with the Remo glacier, at the head of the Shayok. This Remo has yet to be explored.

Then they turned up the Saser to examine the glacier Murgisthang, or rather Monstong, a long straight glacier leading due north. There were no signs of any recent retreat. The glacier had extensive transverse ice streams pouring in on each side, those on the east coming from precipitous splintered peaks, palæozoic and gneiss; those on the west flowing down from wide snow-fields, leading back to a range of no great height, perhaps 21,000 feet, the water-parting of the Upper Nubra.

In 2 miles' distance he saw K 32 24,600 feet high. The névé basin was at a height of 18,000 feet. The great peak rises with a sheer cliff of 4,000 feet of pale-grey, pink granite. To the N. E. and N. W. high peaks were seen, the latter about 23,000 feet. From another ridge in the neighbourhood he again had a superb view to K 32. »An hour's scramble would have put us on its sharp steep western arrête. To the north we overlooked the col and saw a great glacier stretching far away, apparently flowing north and then east to join the Remo glacier. Beyond this were many serrated peaks along the line of the Karakorum watershed, which we estimated by the eye as from 22,000 to 23,000 feet. One rather higher mountain stood out to the north-west; but shining in the far distance we saw some great giants which I felt sure must be Gasherbrum and Bride Peak, 65 miles away.

When Neve the following year returned from the Siachen Glacier he looked up the photographs taken from the Murgisthang ridge and identified Teram Kangri, which he had seen to the N. W.

A *terra incognita* stretched north to the Aghil Mountains, and N. E. to the source of the Yarkand River, explored by HAYWARD.

They¹ went up to Kharmang Kuru and Khapallu. Their plan was to cross the Saltoro Pass. The natives did not know anything about such a pass. »They were unwilling to commit themselves to saying that the mountains either at the head of the Kondus or the Bilaphond were impassable, but said that in the days of their forefathers men went that way to Yarkand and also to Nubra.»

They went 8 miles upstream from Khapallu where the whole valley seemed to have been filled with ice, and where in post-glacial times an immense amount of re-excavation has been done. They also found evidence of former lakes, 1,000 feet above the present river level. At Mandi and Palit extensive fragments of old lateral moraines were clinging to both sides of the valley, 1,000 feet above the river. Dr. Neve is of the opinion that here, as in many of the higher Himalayan and

¹ This is the expedition on which Neve travelled with Longstaff and Slingsby, and of which Longstaff has given a description quoted above.

Kara-korum valleys »the evidence is of the conservative action of glaciers, not excavating their bed, but protecting it from aqueous erosion».

June 11th they marched up to the snout of Bilaphond Glacier where at Ghyari they had their base camp; 60 years before VIGNE had been at the place. The view was open up the Bilaphond, and K 11 was visible as well as the snow saddle of the pass. The natives declared that formerly the Chumik and the Bilaphond Glaciers were separate and nearly a mile farther back. They went up the glacier which was easier the second day, when they camped at Ali Bransa 17,000 feet. Most of the moraines were of reddish felspar granite, and higher up on the east side were some schists. Next day they continued. VIGNE and RYALL had been there before, but not so far. Dr. and Mrs. WORKMAN, three years later, took a different line up the glacier. At 11 a. m. they had reached the summit.

We were fully convinced at the moment that we had crossed the great divide of the Karakorum, and that the valleys to the north drained into the Yarkand River. From our pass we looked up west to the half-hidden peaks of K 11. North, a broad snowfield and glacier led gently downwards to a still larger sea of ice sweeping to the right, the east, and beyond that rose a mighty wall of rocky mountains which we assumed must be the Aghil Mountains of Younghusband.

Next day they continued down the new glacier which was called Teram by the older coolies, and was said to lead to Chang Thang, which probably meant the high mountainous region beyond the Kara-korum, though only 2 marches separated the party from the Nubra Valley. Neve believed that they were on Chinese territory north of the Kara-korum. They were, however, on the biggest glacier they had ever seen. To the west they looked up it some 15 miles.

The elaborate survey which Dr. and Mrs. Workman had carried out during 1912 through Mr. Peterkin, while they themselves explored all the surrounding glaciers and made some important ascents to the Oprang watershed, and also over a snowfield and down the Kondus glacier, has revealed the great size of the glacier, which is far the largest in Asia, or elsewhere outside the Arctic regions.

The main glacier was 2 or 3 miles wide.

I was not personally much impressed with the appearance or apparent altitude of Teram Kangri Mount, about which much has since been written. Judging it by the eye, I reckoned it at less than 25,000 feet. The chief interest for me was the geology of the Teram range, for while all the Karakorum to our south was granite, at a glance I saw that the great wall in front was partly stratified.

It looked to Neve as if the highest part of Teram Kangri Peak might be slate. A few weeks earlier SELLA had photographed some of the peaks they now saw to the west.

The most interesting was to know where the big glacier went to. It was decided to go around to the east. The upper part was left to the Workmans, »who during 1912¹

¹ *Vide infra.*

with most praiseworthy tenacity followed it up, and discovered a snowy pass leading to the Kondus Valley, by which they returned to Khapallu».

As regards Teram Kangri Peak, for a time it was supposed to be over 27,000 feet high, but during 1911 a surveyor — Mr. Collins — was at work in upper Nubra and established beyond doubt that the height was under 25,000 feet, which was near my estimation, published at the time in the Times of India. And certainly Dr. Longstaff had no more desire to exaggerate the importance of the discovery than I had, though his observations, when worked out, had that result, probably owing to the reading at one end of the base line being taken to a different point on the ridge.

June 23rd they started up the great ice-field of the Chumik Glacier. June 27th Neve had to leave his comrades. The continuation of the expedition has, as quoted above, been described by Dr. LONGSTAFF (*Geogr. Journal*, June 1910).

BURRARD and YOUNGHUSBAND had assured Longstaff that the glacier he and Neve had discovered beyond the Bilaphond Pass must be an upper reach of Siachen, which proved to be the case.¹ It is 45 miles in length, »and is the largest in the world outside the polar and subpolar regions».

¹ Cf. p. 450 *supra*.

CHAPTER LII.

THE DUKE OF THE ABRUZZI.

We now come to one of the most important expeditions ever carried out in the High Kara-korum, viz. the Italian expedition, in the summer of 1909, under command of the DUKE OF THE ABRUZZI, and described in the most brilliant way by Dr. DE FILIPPI.¹

The chief object of the expedition was the Duke's »desire to contribute to the solution of the problem as to the greatest height to which man may attain in mountain climbing«. But on the way to this goal the expedition accomplished excellent mountaineering and exploring work »for the purpose of collecting data for the more accurate knowledge of a system of ranges that, taken all together, is perhaps the grandest in the world«. Here already at the beginning of his work Dr. Filippi points out that the Kara-korum is a *system of ranges*, not one range, as it still is often called. In spite of this he however, sometimes uses the term »the Karakoram range«.²

Already before the appearance of the book, Dr. de Filippi had published several articles in different periodicals. In the *Alpine Journal* he chiefly dealt with matters of alpine interest, the geography having been treated in the *Geographical Journal*. To the mountaineers he addresses the following words:

K 2 was selected as being the second highest mountain in the world, and the highest which the political conditions prevailing in the Himalayan regions render it possible to approach. The only European expedition (Guillarmod, etc. 1902) which had seen the mountain at close range appeared to admit the possibility of an attempt.³

At another place he gives an interesting analysis of the rate of march at different altitudes:

From 23,000 to 23,500 360 feet an hour.

» 23,500 » 24,300 270 » » »

» 24,300 » 24,600 160 » » »

The greatest altitude reached was 24,600 feet.⁴

¹ *Karakoram and Western Himalaya An Account of the Expedition of H. R. H. Prince Luigi Amedeo of Savoy, Duke of the Abruzzi* by Filippo De Filippi, London 1912.

² *Op. cit.*, p. 45.

³ Dr. Filippo de Filippi: *The Expedition of H. R. H. the Duke of the Abruzzi to the Karakoram Himalayas. Alpine Journal.* May 1910. Vol. XXV, p. 107.

⁴ *Alpine Journal.* November 1910. Vol. XXV, p. 331.

The expedition passed two months on the Kara-korum glaciers. In the glacier basin explored by the Italian expedition, there are more than 25 peaks above 23,000 feet. One mountain reached to over 27,000 feet. 15 peaks, measured for the first time, all were above 23,000 feet. All these belong to the upper basin of the Baltoro and Godwin-Austen Glaciers.

De Filippi regards the Kara-korum as separated from the Himalaya Proper by the upper course of the Indus. He gives some interesting historical glimpses, the most important of which may be entered here as a recapitulation of the contents in previous chapters.

The name Kara-korum was noted and introduced by WILLIAM MOORCROFT, the first European explorer to cross the chain, about 1820. This statement is not quite correct as Moorcroft cannot be said to have crossed the Kara-korum Proper. The SCHLAG-INTWEITS and CUNNINGHAM as, later on, the WORKMANS, regarded the Kara-korum as a separate mountain system. BURRARD'S Kara-korum, to which we shall have to return later on, includes all the mountains north of the Indus. GODWIN AUSTEN considered the Hindu-kush as the western prolongation of the Kara-korum. The Baltoro Glacier was discovered by Godwin-Austen in 1860—1861, and later on was visited by YOUNGHUSBAND and CONWAY.

The author says: »Eastward the Karakoram range is bounded by the sources of the Shyok, an important stream which, after a long and winding course through the greater part of Baltistan, flows like the Gilgit into the Indus. Between these boundaries the Karakoram chain stretches for about 450 miles». However, the Kara-korum »range» cannot be said to be bounded by the sources of the Shayok!

The ECKENSTEIN, GUILLARMOD, PFANNL expedition of 1902 had obtained the nearest view of K₂ before the DUKE'S journey. In 1892 two peaks, Crystal Peak and a peak of the Golden Throne group had been climbed by Sir MARTIN CONWAY. K₂ is, so far as is known, the second highest mountain in the world. It is only 752 feet lower than Mount Everest, or resp. 28,250 and 29,002 feet.

As to the boundaries of the system, GUILLARMOD places Kashmir between the Himalaya and the Kara-korum, the latter separating Kashmir from Tibet. Zoji-la is situated in the Himalaya. Skardu on the Indus is at the southern foot of Kara-korum.

BURRARD enumerates 33 peaks of and above 24,000 feet belonging to the Kara-korum. They are grouped around the four glaciers Chogo Lungma, Hispar, Biafo and Baltoro. To these comes the gigant glacier of Siachen with its surrounding peaks.

The expedition started in April from Srinagar and travelled the ordinary way over the Zoji-la along the Dras River to its junction with the Indus, and then down the latter to Skardu. From there they went up the Shigar and Braldoh to Askoley.

Having thus penetrated the southern side of the Kara-korum System they had the gigantic Baltoro Glacier with some of the highest peaks on the earth to the east.

May 16th they left Askoley to continue into the ice deserts of the Kara-korum. A little higher up they passed the Biafo Glacier, coming from N. W. into the Braldoh valley. From this point onwards the valley is known as the Biaho. The river flows through a narrow gap between the valley wall and the steep front of the snout of the Biafo Glacier.

During the last 50 years the snout of the Biafo Glacier has undergone constant oscillations. In 1861, according to GODWIN-AUSTEN, it filled the valley and covered the river entirely. In 1892 CONWAY found that it had retreated a quarter of a mile from the wall of the valley, and continued, during August, to retreat another quarter of a mile, leaving a wide moraine. In 1899 the WORKMANS found that the snout barely reached the outlet into the Braldoh valley at all. In 1902 GUILLARMOD says that the snout again had advanced to the right bank of the Braldoh River. Then it retreated to the same position as in 1899, as the Workmans found on their visit in 1908. The DUKE'S expedition visited the region at a new period of advance. From the observations made by travellers on different glaciers of the Kara-korum »every glacier appears to obey laws of its own«. Some »show all the signs of rapid shrinkage«, others are stationary for long periods, and others are in a period of actual increase, often very rapid. In 1905 The Geological Office of India began a series of observations in Western Himalaya for solving the problem and explaining the phenomenon which obviously depends upon climatic changes.

According to Dr. ARTHUR NEVE, the glaciers in these regions are, on the whole, in a period of growth. The material seems as yet to be insufficient for certain conclusions, and observation for a long period is necessary.

Passing Korophon, they camped at Punmah. The Punmah valley comes from a vast glacier system across which there is a pass, the New Mustagh, some 19,000 feet high, not in use. The old Mustagh Pass is also closed. The New Mustagh Pass has never been crossed by Europeans. In olden times the mountains could be crossed by several other passes between Baltistan and Hunza-Nagar, Yarkand, Eastern Turkestan. Now they are all ice-covered and impracticable. The Kara-korum Pass is the only one in use.

The expedition again camped at the snout of the Baltoro Glacier, at a place called Paiju. According to Filippi, the snout had retreated about 300 yards between 1903 and 1909. The Baltoro Glacier, 36 miles in length, has no frontal moraine. As a rule the absence of frontal moraines is characteristic in all the great Kara-korum glaciers, Siachen, Biafo, Hispar, Baltoro, Chogo Lungma. Filippi explains this phenomenon »by the immobility of the terminal portion of these glaciers, which has turned into dead or stagnant ice, and may be considered, geologically speaking, in every respect as rock«.

The end of the Baltoro is at about 11,000 feet, the Biafo at 10,180, Siachen at 11,600 (Longstaff 1909), Hispar at 10,803 (Workman 1908), Chogo Lungma at 9,519 (Workman 1902).

The expedition continued on the stony waste of the lower Baltoro to Camp Machichand. Passing the Liligo the march thence went on, partly on the gravel of the Baltoro moraine, partly at its side. Rdokass was chosen as Base Camp, at about ten miles from the end of the glacier, and at an altitude of 13,205 feet.

As to the length of glaciers, Filippi mentions Siachen = 45 miles (LONGSTAFF), Inylchek, Tian-shan = 44 miles (MERZBACHER), Biafo = 37 miles (WORKMAN), and Hispar = 36 miles (WORKMAN), no other known glacier reaches 30 miles. The longest glacier of the Himalaya Proper, the Zemu of the Kinchinjunga group, is 16 miles (FRESHFIELD).

From 11,000 to 15,700 feet the Baltoro ascends with a gradient of barely 3.5%. This glacier fills its bed completely. Many glaciers of tributary valleys flow out on the top of the Baltoro with a high front and without terminal moraines.

Opposite Rdokass is a valley filled by the Mustagh Glacier which leads to the old Mustagh Pass, 19,000 feet, over which Askoley communicated with Yarkand. VIGNE says it was open in the first half of the last century. In 1861 it was impracticable, according to GODWIN-AUSTEN. In 1887 YOUNGHUSBAND passed it on his way for Kashgar. In September 1903 FERBER and HONIGMANN went up to the Mustagh Pass.

The Mustagh route seems to have been occasionally used in bygone times. STEIN and LONGSTAFF suppose that it was used only during troublesome times and chiefly by war refugees and messengers, but not during peace.

At Rdokass the movement of the glacier was 361 feet in 62 days. Thus 10 miles from the snout the central stream of the Baltoro had an average daily speed of 5 feet 10 inches. As a rule, the giant glaciers of the Kara-korum flow at a much higher speed than the ordinary alpine glaciers.

From the Base Camp, on May 23rd, they continued up the Baltoro Glacier. The medial moraine had a height of 100 to 200 feet above the level of the glacier. A central upheaval of the ice starts abruptly from the surface of the glacier, possibly brought about by the pressure of the glaciers against each other when they meet, in this case the Godwin-Austen Glacier and the main glacier.

They passed the Younghusband Glacier at about the point reached by GODWIN-AUSTEN in 1861.

Ice pyramids up to 70 feet high were seen on the Baltoro. They are characteristic for this glacier. In the upper parts of the glacier they do not exist, but there are conical hillocks up to 300 feet high, glacier lakes, and glacier tables.

They passed Crystal Peak, 19,400, from which CONWAY had discovered the basin where the Godwin-Austen, Upper Baltoro and Vigne Glaciers meet. Turning north they had the Godwin-Austen Glacier in front, and in the background the K2.

May 25th. They had camped at »Concordia«, where the two great main branches of the Baltoro meet: the Godwin-Austen Glacier coming from the K2 in the north and the Upper Baltoro Glacier coming from the Golden Throne and Bride Peak in the S. E. Two other good-sized glaciers come down the western side of the Broad-Gasherbrum chain. These four glaciers are at least five miles broad. Numberless smaller tributaries come in from other parts of the chain. The Baltoro valley itself is less than two miles broad. The glaciers are covered with almost geometrically regular moraines. FILIPPI gives a very good description of the magnificent landscape.

The Concordia Basin is, on account of its situation, the best base of departure for topographical work. K2, Gasherbrum IV, Bride Peak (Karakoram No. 8) and Masherbrum I, 4 of the most important trigonometrical stations, are visible from it.

The whole chain of Broad Peak, the Gasherbrums, including Hidden Peak and Golden Throne, is sedimentary formation. The mountains west of it, from Staircase to Bride Peak are crystalline rocks, granites, gneisses, quartzes.

Broad Peak (27,132) is the sixth of the highest known mountains: Mount Everest, K2, the two peaks of Kinchinjunga, and Malaku in the Everest group being the highest.

The next Camp, III, was pitched at the southern foot of K2. Provisions for one month were brought up.

The eastern side of K2 was extremely steep. The same observation had been made by YOUNGHUSBAND from the north. From Camp III, K2 was examined. Synchronous meteorological observations were taken. The height was 16,493 feet.

On May 30th the DUKE made a dash on the southern side of the K2, and in the beginning of June the examination of the Savoia Glacier, west of K2, began. Here they camped at 18,176 feet on the glacier. From this starting point the western face of the K2 was examined. At the head of this glacier the Savoia Pass was 21,870 feet high. The northern side of the K2 proved to be inaccessible. The new glacier and the pass had been discovered by the Duke.

FILIPPI has a rather sharp criticism of GUILLARMOD'S map of the upper part of the Godwin-Austen Glacier, as well as of the altitudes, which are »generally considerably in excess of the ones measured by us«. The upper Godwin-Austen Basin is, on Guillarmod, over 9 miles long, in reality less than 4 miles. »The bearing of the valley is incorrect.« Dr. PFANNL'S map of the same expedition is »nearer the actual dimensions of the valley than the map published by Guillarmod. The outline of the chains and ridges is also more nearly correct.«

From his Camp VI, 18,602 feet, the Duke examined the eastern slopes and region of K₂. From some objects left at camp X of Guillardmod seven years before, one could argue an average yearly speed of 702 feet for the glacier.

From the east, K₂ proved to be a mountain of ice. On June 22nd SELLA took a panorama from a point near the Sella Pass and got a general aspect of the region east of the Baltoro Basin, »a region into which but one single explorer, Sir FRANCES YOUNGHUSBAND, has ever penetrated, and he only for a short distance, in 1889. As far as the eye can see, there is a succession of glacier-filled valleys and rocky and snowy chains.»

On June 14th they started to the camp of Windy Gap, VII, at the beginning of the Godwin-Austen Glacier.

Windy Gap, 20,449 feet, is the limit in the direction of the hydrographic system of the Baltoro basin and of the Indus. From this side the K₂ »looked like another mountain entirely; and of all the manifold aspects of the colossus this is certainly the most imposing, the richest and boldest in design». N. E. of Windy Gap they could see a chain running N. W.—S. E., and beyond it still another chain, higher and more important.

From a point 21,650 feet high, near Staircase Peak, the Duke took a good photo of K₂.

Having explored the K₂, its glaciers and surrounding ranges on the S., W. and E., the DUKE summarizes his observations thus.

He found K₂ to form a

quadragular pyramid, the corners being formed by four main crests meeting at right angles the south-west and north-east, the north-west and south-east. The first two are prolonged in long and powerful buttresses, proportionate in size to the mass which they sustain. The other two are cut off short and precipitously....

K₂ has only *one* peak. It is not to be climbed.

On June 30th they went south, walking on the moraines of the Godwin-Austen Glacier.

Up to nearly 18,000 feet some alpine plants were found in sheltered places.

On July 6th they started southwards on the Upper Baltoro. At the foot of the Golden Throne, Camp XI, 16,637 feet, was chosen as base camp for a new campaign. Magnificent photos were taken of the Mustagh Tower, which seems to be a monolith, »a rocky mass of a single formation, without traces of breaks or divisional planes — no other, of any comparable size, is known to exist on the globe».

The limit of the eternal snow is, in the Western Kara-korum, put at 18,000 feet by DREW and BURRARD.

From the base Camp at the foot of the Golden Throne, the Duke began his operations upon Bride Peak.

In three stages he went up to the Chogolisa Saddle, where he camped at 20,784 (XIV). Camp XV, approaching Bride Peak was at 21,673.

On July 12th, they reached 23,458 feet. At the higher camp, XV, the height was 22,483.

No one before now had ever camped at such a height, except possibly Longstaff. In 1905 he passed a night in the open on the snowy crest of Gurla Mandhata, at a height tentatively estimated by him to be about 23,000 feet.¹

On July 18th the Duke nearly reached the Bride Peak, but retreated at a height of 24,600 feet. »The height attained by the Duke exceeds by 700 feet» all earlier records. He gives the highest points reached by men. »Longstaff climbed to a considerable height on the ridge of Gurla Mandhata in 1905 — probably beyond 23,000 feet, though instrumental observations of the altitude were lacking.»

On his first expedition, 1887, YOUNGHUSBAND crossed the old Mustagh Pass and the Baltoro. He discovered and crossed the Aghil Chain situated between the Kwen-lun and the Kara-korum, separating the Yarkand-darya from the Oprang River system. In 1868 HAYWARD had seen the Aghil Chain, which he believed to be the Kara-korum. (See *Proc. Roy. Geogr. Soc.*, 14., 1869, p. 41). In 1889 Younghusband crossed the Aghil Chain again. He found it running N. W.—S. E., 125 miles long with snowy peaks up to 23,000 feet.

Younghusband followed the Oprang valley up, believing that it led to the Saltoro Pass, which, according to tradition, was a way between Baltistan and Kashgar. In 1909 the Saltoro Pass, which is merely a short-cut between the Shayok and Nubra Rivers, was discovered by LONGSTAFF. Younghusband's observations and maps of the Upper Oprang valley could not be brought into harmony with those made by the DUKE at Windy Gap. »Nor were the factors established by the expedition enough to warrant the identification of the Aghil chain with the mountain range which the Duke had seen to the east, and which he and Sella had photographed.» — »In any case, the panoramas taken by Sella and the Duke depict an utterly unknown region between the Oprang valley, the upper Siachen Glacier and the Broad-Gasherbrum range.»

Of special importance are the collections of specimens of rocks made during the expedition and described by VITTORIO NOVARESE and R. D. OLDHAM. The fundamental outlines of the geology of this part of the Kara-korum had been drawn by H. H. GODWIN-AUSTEN and R. LYDEKKER. The latter's map was published in 1883 and reproduced in the second edition of the *Manual of the Geology of India*, 1891. At that time, however, the geology of the Baltoro Region was perfectly unknown. To this knowledge CONWAY added important material, and LONGSTAFF

¹ As shown above, this record cannot be taken into consideration.

carried on researches thirty miles to the S. E. in the valley of the Siachen Glacier. The most important of all was the expedition of the DUKE.

Specimens collected from rock *in situ* are, however, few in number, and the greatest part comes from glacier moraines. So »a tolerably good idea may be formed of the constitution of the slopes from which each is derived«. I do not need to say that a thorough geological survey of the High Kara-korum will take generations. It will have to be carried out by specialists, whose work will be much more arduous and difficult than that of the glaciologists, topographers and mere climbers.

Now we are told that:

The rocks of which specimens were procured belong to the two categories of crystalline schists and sedimentary deposits, with the addition of certain specimens of serpentine. Apart from this last there are no representatives of eruptive rocks, although granite is highly developed in the mountains of the Baltoro valley.¹

The following classification is very important:

A. Schists and Crystalline Rocks.

1. Biotite gneiss on Bridge Peak *in situ*.
2. Noble Serpentine collected along the whole course of the Baltoro and had previously been recorded by Lydekker from the Shigar region and considered to be of mesozoic age, and by Conway from White Fan Pass and Crystal Peak.
3. Vein Quartz on Bride Peak.

B. Sedimentary rocks.

The rocks of palpably sedimentary origin, collected in the Baltoro moraines, fall into two principal groups; one composed of schists and siliceous anagenites, the other of most various limestones, dolomites and calcareous breccias.

The calcareous group presents an extraordinary wealth of varieties and can be divided into three sub-groups: limestones, comprising also dolomites and dolomitic limestones, coloured marbles, and breccias, the latter more abundant than all the other rocks.

According to Vittorio Novarese, the specimens collected at the camps are insufficient for an attempt to arrange the various types in their order of geological sequence. However, some of the calcareous breccias with micaceous cement come from the contact zone of the schists and anagenites with the limestone and dolomite.

The determination of the geological age is impossible, as no organic remains were found. Only comparison with the rocks known in other parts of the district, enables the geologists to make an approximate determination. A great complex of formations (alternations of schist, limestone, dolomite containing serpentine, and quartzites — Lydekker and Godwin-Austen) occurs in a syncline between Shigar and Askoley, in Baltistan, and in the range rising west of the Biafo Glacier: this complex is supposed to be the equivalent of the formations of the Upper Baltoro valley. Lydekker ascribes this so-called Baltistan-Braldoh syncline to his Zaskar System, attributed to a carbon-mesozoic age. »The series which is fossiliferous at Shigar and comparable

¹ Op. cit., p. 430 *et seq.*

with that met with on the Sasser Karakoram track, certainly includes the permian and trias, together with older beds at the base and newer ones above.» Novarese accepts, provisionally, a similar correlation for the sedimentary series of the Upper Baltoro.

According to the observations of all explorers the Baltoro valley, from the end of the glacier up to the confluence of the Godwin-Austen Glacier, is opened through the gneisses and granites of the Baltistan massif. On the right of the Baltoro, however, in front of Rdokass, Novarese finds it probable that the remnants of an enormous, nearly horizontal layer is superimposed on the massive gneiss. In this part of the Mustagh, therefore, may exist the remains of a capping of sedimentary rock regularly covering the gneiss and composed of dolomites.

On the right of the Baltoro, opposite and north of Mitre Peak, a marble crag rises from one of the buttresses of Crystal Mountain.

»The formation of schists, anagenites, limestones and dolomites shows up in its full development in the terminal mass, lying between the Godwin-Austen and Upper Baltoro Glaciers, which is crowned by the three peaks Broad, Gasherbrum and Hidden.» Bride Peak seems to be composed of gneiss above, and at the base, of granites and granitoid gneisses. The base of K₂ is formed of the same materials. Many questions are left obscure on account of the scarcity of specimens from rock *in situ*. Novarese summarizes the results as follows: »The valley of the great glacier is closed on the north by a very elevated massif, composed of sedimentary rocks of upper palæozoic and mesozoic age, prevailingy calcareous and, therefore, differing widely from the mountains of the rest of the valley, which are entirely, or prevailingly, granitic and gneissic».

The terminal peaks of Broad, Gasherbrum IV, Hidden and Golden Throne, seem to be formed of limestone and dolomite. They are thus the first known peaks of about 26,500 feet formed of sedimentary rocks.

In 1878 STOLICZKA, and later on LYDEKKER, described the palæo-mesozoic rocks in the Chang-chenmo-Kara-korum region of Eastern Ladak. This palæo-mesozoic area runs north-westwards, parallel to the gneissic mass of Baltistan, »It had been traced to Sisil, between the Nubra and Shyok valleys, on the road to the Kara-koram Pass, but its ultimate course and end remained unknown.» The mesozoic limestone seems to continue for some 90 miles, including parts at the Upper Siachen and Gasherbrum.

Novarese points to the geographical importance of this fact. »The course of the watershed between the Indus valley and the closed drainage area of Turkestan, from the Mustagh to the Kara-koram Pass, was uncertain and badly known, in spite of certain peaks having been trigonometrically fixed, as it had been barely seen and never crossed by the explorers who followed each other at long intervals.»

LONGSTAFF'S supposition that the Teram Kangri was formed of limestone, has attained a certain probability from the Italian observation in the Gasherbrum massif. It rises about S. E. of Broad Peak. The extension of the Siachen Glacier to the vicinity of the mountains at the head of the Baltoro increases the importance of the Italian observations.

LONGSTAFF and NEVE supposed that the Siachen was in communication with the Baltoro directly over a saddle at the base of Hidden Peak, in the same way as the Biafo and the Hispar. But such a continuity does not exist. The Kondus Glacier, south of the Broad massif, comes in between them. It is not impossible, however, that, in spite of the interruption, Baltoro and Siachen lie in the same tectonic furrow. But the analogy in the two cases does not exist.

The course of the water-parting between the Indus and Yarkand-darya has been proved by the Italians to be much more complicated than shown on the maps.

NOVARESE gives the following *résumé* of the orography:

The Karakoram, like the Himalaya of which it is the western portion, consists of a series of chains parallel to each other, and also approximately parallel to the course of the geological zones and leading tectonic features, ill-known as yet, of the whole great system. The rivers flow in open valleys between these chains, and narrow, deep-cut channels, frequently reduced to impassable gorges, by which the rivers pass from one valley to the next, sever the chains in pieces. Consequently, although the lines of peaks appear continuous on the map and exhibit a sensible parallelism, the principal watershed, and many of the secondary ones, have a very different course, proceeding by stretches as they pass from one range to another by means of transverse ridges, which separate the divergent slopes of each of the furrows contained between a pair of ranges. — On the whole then, as this passage of the watershed from one chain to the next takes place for long stretches in a regular manner, always from a more forward range to one further back, the complex course of the line of watershed cuts, at a very acute angle, the general direction of the ranges, so that it is easy, in ill-known parts of the system, to confound two quite distinct members with each other and regard them as only one. Just this confusion was made in all maps anterior to 1910 in the country between the Upper Baltoro and the Karakoram pass. — The discovery of the Upper Siachen, and of Teram Kangri, has shown the existence of a great longitudinal furrow, occupied by a glacier, and of a chain, parallel to that, well known and fixed, which runs from K 2 to Hidden Peak and, up to now, was called the main range of the Karakoram. The ridge by which the watershed crossed from this to that of Teram Kangri is formed by that saddle between the head of the Kondus and the Siachen which was seen from Chogolisa. The chain of K 2 is truncated by the Kondus valley, whose tortuous course in the upper part indicates a breach of continuity, filled with ice, but where this disappears, exhibiting itself as one of those impassable gorges in which the Karakoram is rich. It is probable that the continuation of the chain of K 2 is that in which the peaks K 9 and K 10—11 are found, these latter over 25,000 feet in height, and in the Saltoro chain to K 12 and beyond.

In conclusion, Novarese finds it certain

that the water-parting between the Indus and the Central Asian drainage, after passing the peaks of K 2, Broad, Gasherbrum and Hidden, turns eastwards to a parallel

range which bounds the Siachen on the east and probably culminates in Teram Kangri. A good part of this range was already known, for it runs from the Sasser pass, for more than 100 miles south-eastwards to the Pangong Lake, and is cut through by the precipitous gorge of the Shyok, in the reach which lies above the sharp elbow formed by this river, a little below its junction with the Chang-chengmo. The range of K 2 runs south-west of this, and although the complexity of its geological composition — for granites, schists and various sedimentary rocks take part in it — has a very sensible influence in multiplying and increasing the accidents of relief, it has not rendered less evident the orographical continuity, which is obvious enough in many parts.

The two chains of K 2 and Teram Kangri, are, therefore, well distinct, and the resemblance between the Karakoram and the double chain of the Hindu Kush, already suspected by some, has a real basis. The latest discoveries have revealed the importance of the Teram Kangri range, which is promoted from the position of a secondary spur of the presumed watershed range, to that of a primary range of the system. The continuation of this range, to the northwards, is certainly that row of peaks, which the Italian expedition observed from Windy Gap, and which will now become the object of fresh journeys of exploration.

This was written in 1911 and has not been surpassed.

According to OLDHAM the case for regarding the limestones as belonging to the sedimentary series, either as a continuation of the Gasherbrum exposure or as an outlier, is stronger than is represented by NOVARESE. He, therefore, on different grounds, especially the observations of CONWAY, finds it at least possible that we have to deal with an exposure of the limestone series, penetrated by intrusive veins of syenite and gneissose granite.

Regarding the classification of the mountain ranges, Oldham does not agree with Novarese.

The view advocated by Drs. Longstaff and Neve is rejected on the ground that there is no structural continuity between the Siachen, Baltoro and Biafo valleys, such as would give them a geological unity and justify the mountains on either side being regarded as forming two separate ranges; but, if this argument is allowed to prevail, it would equally militate against the view which regards the mountains on either side of the Oprang-Nubra trough as forming a pair of parallel ranges, for this orographical depression certainly does not follow, but runs obliquely to, the general strike of the leading feature in the geological structure of the district, namely, the Karakoram syncline of sedimentary rocks.

Oldham does not regard the argument as final, as the movements of elevation occurred during a long period,

and it may well be that the latest of them, those which determined the rows of peaks as they now stand, did not exactly follow the earlier ones, by which the leading features of geological structure were marked out. Moreover, the case for the classification adopted in the note is stronger than is there set forth, for not only is the Oprang-Nubra trough similar to the much larger depression formed by the Suttle and Sanpo valleys, on the northern side of the Himalayas, but there is an apparent connection between the two, for the former is continued south-eastwards, by the Shyok valley up to the elbow, where it bends from a southerly to a north-westerly course, and thence by the lower part of the

Pangong Lake to the Upper Indus, and by this to the Sutlej valley. To the south-east this line of valleys has been held to be sufficient reason for separating the Himalayas, on the south, from the mountains to the north, so that if Ing. Novarese errs in separating the Teram Kangri peaks from those of the K 2 and Gasherbrum group, he errs in good company. And if this view is accepted, then the series of peaks, labelled K with a number by the Survey of India, can no longer be regarded as belonging to the same range that is crossed by the Karakoram pass, and a different name, Mustagh for choice, would have to be given to them and to the mountains which have been repeatedly described as the Karakoram Himalayas.

Oldham thinks it possible that the Teram Kangri and Gasherbrum peaks fall into the same range, continued probably to K 2 and the Mustagh Peaks, and this range would, as a structural unity, not be interrupted by the deep gap between Teram Kangri and Gasherbrum or by the Godwin-Austen Glacier. Oldham shows how little is really known of this region and how difficult the classification of the mountains is. The structure of the region is not understood. He does not find it impossible that the K 2 and the Mustagh Peaks belong to the group of ranges crossed by the Kara-koram Pass, »which together have come to be known as the Karakoram mountains».

CHAPTER LIII.

THE EXPEDITION OF DR. AND MRS. WORKMAN 1911—1912.

During the summers of 1898, 1899, 1902, 1903, 1906 and 1908, the WORKMANS had travelled and surveyed in the High Kara-korum. To the store of knowledge which they, with indefatigable zeal and endurance, had collected, they added new and very important explorations in the summers of 1911 and 1912. The experiences of the latter period are set forth in a book, the appearance of which was delayed by the war until 1917.¹

The expedition of 1912 was the more important of the two. Even the first news gave us an idea of its results. The *Alpine Journal* told us that Dr. and Mrs. WORKMAN in July 1912 ascended four snow cols at the two sources of the Siachen Glacier, from 19,500 to 21,000 feet high.

On two of these ascents Mrs. Bullock Workman established the relation of the North-East Karakoram water-parting with Kashgar; on the two others she discovered two passes to the large unknown Kondus glaciers.

From the N. E. Siachen col a pass to Kashgar was found. Beyond the east Siachen boundary a new group of high peaks was discovered on the Kashgar side, one probably over 25,000 feet high. The Siachen could now be said to be the most thoroughly examined of all Himalaya glaciers.²

It cannot be said to improve the orographical classification to count the Siachen amongst the Himalayan Glaciers. The giant glaciers belong exclusively to the Kara-korum System. The same journey correctly points out that the region between the Siachen and the Kara-korum Pass is still unknown.

In 1911 the Workmans crossed the Saltoro River to Kapalu, from where they went up the Saltoro valley. It was their plan now to explore the region between the Saltoro valley and the Baltoro Glacier, and extending westward from the Siachen

¹ *Two Summers in the Ice-wilds of Eastern Karakoram, the Exploration of nineteen hundred square miles of Mountain and Glacier* by Fanny Bullock Workman and William Hunter Workman, London 1917. — The work is illustrated with three excellent maps and a series of brilliant photographs.

² *Himalayan Exploration in 1912, Siachen Glacier. Alpine Journal.* November 1912. Vol. XXVI, p. 441.

watershed to the western barriers of the glaciers draining into the Hushe valley. The wild and precipitous mountains of this region rise to a very considerable height, seven peaks being from 23,900 to 25,676 feet. Many of them are granite and gneissoid formations. The valleys between them are narrow and deep-cut.

The Workmans first marched to the Sher-pigang and Dong Dong Glaciers, both of small size, and then to the Kaberi or Kondus Glaciers. The next excursion was to Hushe from where they proceeded to the Aling, Masherbrum and Khondokoro Glaciers. Their observations did not always confirm those of GODWIN-AUSTEN:

Colonel Godwin-Austen, in the *J. o. t. R. Geogr. Soc.* 37, 1864, pp. 20-21, mentions his Survey work of the Khondokoro and Masherbrum glaciers in 1860 very briefly, devoting only seventeen lines to the description of them both, the first under the name of «Atoser». He does not state that he ascended the Masherbrum any appreciable distance, but on the Indian survey, sheet 44 A, S. W., on which this region is shown, what appears like a route-line runs up the nala on the west side of the glacier to a point marked 13,985, three miles above the end of the tongue, which, presumably, represents his route or that of some other surveyor and the point where it ended. That he did not go beyond this point would also appear from his statement: «Some five miles up, this glacier forks, each branch being about seven miles in length.» This statement does not accord with his own map, or with the Survey sheet, or with the conformation of the glacier as we found it in 1911.

The Masherbrum Glacier was found to consist of a single trunk. The peak of the same name was a brilliant sight as seen from S. W. Its height is 25,660 feet. On the 8th of August they again descended the Hushe valley.

Dr. Workman points out the conditions unfavourable to the preservation of records that might have been left on the rocks by glaciers of former ages, but he by no means denies glacial epochs in the Kara-korum previous to the present. He says:

When one takes note of the incredible amount of débris, which had been and is being brought down by the myriad glaciers of these great mountains and excreted by them as gigantic moraines, which lies piled up everywhere throughout the valleys in huge rock-heaps or tali, 1000 feet or more high, against the faces of the cliffs; which, accumulated in, has been washed out of the gorges by floods and deposited on the valley-beds as vast fans hundreds of feet thick and with a spread of more than a mile; all of it within recent geological time having formed portions of solid mountain-walls, one can understand how evidence left on rock-surfaces by former glaciers might be totally obliterated.

Part II of the book contains *The Conquest of the Great Rose, or Siachen, the World's longest non-polar glacier*. It is written by Mrs. FANNY BULLOCK WORKMAN.

This glacier was first seen by Colonel HENRY STRACHEY who in October 1848 ascended its tongue for two miles. At the close of their summer's exploring of 1911, the Workmans crossed to the Siachen and made a new reconnaissance of its basin. Two of its largest affluents were explored and a peak of nearly 21,000 feet was climbed.

In April 1912 they again were at Srinagar. From the Saltoro valley they went up to the Bilaphond Glacier, which had been ascended for six miles by VIGNE

in 1835, and in 1909 surveyed by LONGSTAFF, NEVE and SLINGSBY. The snout was found advancing slightly in 1911 and 1912. At Ali Bransa, 16,970 feet high, a night was passed. The Bilaphond La on a crest above the glacier, was found to be 18,370 feet high. The »Saltoro Pass« she thinks is still undiscovered. Longstaff's saying that »usage and tradition« have given the name Saltoro to the pass at the head of the Bilaphond glacier can, therefore, not be correct.

After Mrs. Bullock Workman's paper which was read at the Royal Geographical Society, November 24th, 1913, and which is published under the title *The Exploration of the Siachen or Rose Glacier, Eastern Kara-koram* in the *Geographical Journal*, February 1914, p. 117 *et seq.*, Dr. LONGSTAFF said:

I fear that the constant changing of geographical names will lead in the future to as much confusion as has fallen upon biologists from the same cause.

The name Saltoro pass has already been accepted by the Survey of India.... It is used in the official *Sketch of the Geography and Geology of the Himalaya Mountains and Tibet* (Chart 20). It also appears on the official map to illustrate Younghusband's explorations. But apart from any of these precedents it is unquestionably the most important high pass leading directly into the Saltoro valley from anywhere. The study of these native names is fascinating, but beset with difficulties. Lolophond sounds rather familiar to me. It is the name of a camping-place, apparently our second camp beyond the Saltoro pass. To such the natives not infrequently attach the name of some person who has been there. For instance, Doulat beguldi — the place where Doulat Beg died! Now, Loloff was about the nearest the Baltis could get to my name, though Ladakis and Tibetans can get much nearer to Longstaff. It is quite an unexpected compliment for which I am duly grateful.

However, the following note by the Superintendent of the Trigon. Survey, G. P. LENOX CONYNGHAM, was sent to Mrs. BULLOCK WORKMAN in May 1914 by Sir SIDNEY BURRARD, the Surveyor-General of India, expressing the opinion of the Survey regarding the name mentioned above. He first gives the history of the name and finally says:

We now know that at the top of the Bilaphond glacier there is a pass which gives access to the Siachen. For this pass the name Bilaphond La is proposed by Mrs. Bullock Workman, and as the name Bilaphond seems well-established it is quite appropriate that the pass should be called after it. The pass which Sir F. E. Younghusband attempted to cross must be on the other side of the Siachen glacier and must lead over the main watershed, which separated the Nubra from the Oprang — India from Turkestan. Henceforward it would seem advisable to discontinue the use of the name Saltoro for a pass, and use it for the river only; to adopt the name Bilaphond La for the Pass connecting the glacier of that name with one of the branches of the Siachen, and to await the definite discovery of a pass from the Siachen to the Oprang before considering what to call it.

As to the name »Loloff«, Mrs. Bullock Workman shows that the name Lolophond has nothing to do with that of Dr. Longstaff. Nor did the natives regard the visit of Dr. Longstaff to Lolophond as an historical event of the same importance

as the death of Sultan Said Khan Ghazi near Dapsang in 1533, which gave rise to the still existing name of Daulet Bek-öldi.

The Siachen Glacier has a width of $2\frac{3}{4}$ miles at the entrance of the Lolophond. To the west is the Peak 36 = 25,400 feet, and to the N. E. is the Teram Kangri, 24,510 feet. The Tawiz Peak, 21,000 feet, north of the Lolophond Glacier was climbed, and a commanding view of the Siachen presented itself. The only Baltoro Peak that could be identified was the Bride Peak, 25,110 feet.

She calls the Siachen the Rose Glacier, which is a translation of the word. She uses both. It is the largest glacier in Asia.

From the point where the Lolophond meets the Siachen they began their exploration.

Opposite to them from the east, the Tarim Shehr Glacier enters. Between the two is the Junction Peak, 20,840 feet high.¹

The gradient of the Siachen Glacier in a distance of 12 miles upward from Tarim Shehr, showed a rise of 1,442 feet, or one foot in 37. The best route is along the eastern medial moraines.

The Peak 36 Glacier, coming from the west, was examined. It enters the Siachen just above the Lolophond Glacier.

The water-parting ridge is not seen at all from any part of the Siachen Glacier.

The Siachen Glacier finds its main source in the King George V Group Peak 23, 26,470 feet. In its upper reaches or rather its east arête, descends to the col and

¹ The term «Teram» Mrs. Bullock Workman had found to be unknown, both amongst Asiatic natives and European scholars. «As Tarim is used in Chinese Turkestan for cultivated areas or oases, it is possible as Sir Aurel Stein suggests, that the Baltis may have heard of it in connection with the Tarim basin or Yarkand as applied to the country beyond their frontier, and by usage easily have perverted it into Teram, which they applied to Tarim Shehr.» She has left the name Teram Kangri unchanged on her map. She is quite right in defending the correct spelling of names against attempts to save the wrong ones. If a traveller has written Chak-chimmo instead of Chang-chenmo, the wrong term has, of course, to be abolished. It is one of the objects of geographical exploration to try and get as pure spellings as possible. In the case of Teram Kangri, Dr. LONGSTAFF, however, is certainly right, especially if the a is pronounced as an e (as in «embroid»). *Tarim* means river in East Turkish, *Terem* is a region of agriculture from the verb *teremaq*, saw. In Eastern Turkestan I have visited three villages of the name Terem (cp. *Pet. Mitt.*, Erg. Bd. XXVIII. 1900, Index p. 367). In my *Scientific Results* (Vol. II, Index p. 690) the name returns. Terimi-mojughu and Terimi-mojuk I have there translated «The Cape of the Cultivated Fields». If a channel or river is situated near a village Terem, the watercourse may also be called Terem. In *Tarim* there is always a meaning of flowing, streaming. When in the middle of the lake Kara-koshun one comes to a place where the current is visible, it is called *tarim*. *Tere* means skin, *Terema-köli* = «The Lake of the Fish-skin». The Baltis have never heard of the River Tarim, at least not of the «Tarim Basin», which as an object of physical geography is unknown even to the natives of Eastern Turkestan. Yeti-shahr or Alti-shahr are the common terms for this country, though Yarkand is still more in use. Teram Kangri, meaning «The Ice Mountain of the cultivated Field», and Tarim Shahr, meaning the «Oasis city», are both nonsense. Probably Terem and Tarim, near the Siachen Glacier, are one and the same word, differently pronounced by natives from different villages and having a meaning, perhaps in Balti or in Tibetan, that is not cleared up. One Turki and one Tibetan word combined, as in Teram Kangri, seems to be very unlikely.

builds this part of the water-parting between the Indus and Chinese Turkestan. »From here the watershed turns south-east and follows the north-east Siachen wall for 14 miles, beyond which we could not with certainty trace it, but it is, apparently, formed by the remainders of the wall extending to the head of the Tarim Shehr Glacier. With the exception of the Gusherbrums all the mountain-area visible towards Chinese Turkestan appeared less high and snowy than on the Karakorum side.» N. E. of Peak 23 was the Gusherbrum Glacier. Its tongue had been visited by YOUNGHUSBAND in 1889. It is situated on the other side of the Kara-korum water-parting. The Indira Col on the crest had an altitude of 20,860 feet.

The Urdok Glacier seemed to be the one which in 1889 was ascended by YOUNGHUSBAND. Dr. LONGSTAFF'S »Younghusband Saddle« the location of which he, after Mrs. WORKMAN'S paper, found »substantially correct«, was in reality »not correct at all«. The Workmans discovered the two cols Indira and Turkestan La on the watershed-ridge toward the Turkestan side. Mrs. Workman thinks the saddle could never be used to Baltistan or Nubra by Kashgar people, and there is here no obvious route such as exists from Nagar over the Hispar Pass to Baltistan.

The West Source Glacier was explored. A series of new Kara-korum giants were measured and photographed in a fascinating way. There are names of silver and gold and kings and queens and ministers in the desert of eternal ice!

She does not at all believe in either the Bilaphond La or the Siachen Glacier having been at one time a route from Baltistan to Chinese Turkestan. It is very unlikely that people either from Nubra or from Baltistan would attempt passing by the east Siachen affluent. The question of old native routes will still have to await its solution. Great discrepancies exist in the information of different travellers in this respect.

Finally, Dr. HUNTER WORKMAN has written a most interesting series of chapters on the physiographical features of the Bilaphond, Siachen and Kaberi basins and glaciers.

Dr. Workman points out that the term »glacier« is not sufficiently comprehensive to designate accurately the immense, and, in arrangement, complicated bodies of snow, névé, and ice collected in the great rock-basin extending north-west from the source of the Nubra river to Peak 23 (Hidden peak), forty-nine miles, with an east and west average width for a considerable distance of twenty miles, and having an area, approximately, of 900 square miles.

He designates these glaciers as belonging to a special type which he calls the Karakoram type:

The basin is crossed in various directions by many glaciers of the first order, and innumerable lesser ones, fed by snow precipitated upon the mountains and slopes of its watershed, all converging on a great central trunk averaging 2.5 miles in width, that stretches the length of the basin in a north-west by south-east direction, and discharges from its

tongue water derived from the snow collected in all parts of this extensive region to give birth to the Nubra river. This central trunk, with its multitude of affluents resembling a river system, is more fittingly styled the Siachen glacier-system. The four other great Karakoram glaciers, as well as many smaller but by no means insignificant ones, are fashioned on the same plan. This type is peculiar to the Karakoram, being conditioned on the configuration of its valleys and the arrangement of its peaks. For this reason, as well as on account of certain structural features referable to existing conditions, all these glaciers merit the designation of *glacier-systems or glaciers of the Karakoram type*.

Dr. Workman adds that the enclosing barriers of the Siachen consist of granite, gneiss, crystalline schists, slates and shales, sandstones, amorphous and crystalline limestones and conglomerates, with some igneous intrusions. He compares the N. E. wall of the Siachen trunk in structure and extent with that, which, with an unbroken length of 39 miles, forms the upper portions of the southern Hispar and west Biafo barriers.

The following table of dimensions and falls of the greatest glaciers is of special interest:

	Length		Head		Tongue		Total fall		Average fall
	Kil. = miles		metres = feet		metres = feet		metres = feet		
Siachen	72	45	6,500	20,992	3,704	12,150	2,696	8,842	1 to 26
Chogo Lungma	48	30	5,854	19,200	2,926	9,600	2,928	9,600	1 to 16
Biafo	59	37	5,335	17,500	3,201	10,500	2,134	7,000	1 to 27
Hispar.	58.5	36.6	5,335	17,500	3,353	11,000	1,982	6,500	1 to 29
Baltoro	57.6	36	5,072	16,637	3,353	11,000	1,719	5,636	1 to 33

It would take us too far to enter further into the details of the fascinating book of Mrs. and Mr. Workman, which is one of the most important contributions ever given to our knowledge of these mountains.

The Exploration of the Siachen or Rose Glacier, Eastern Karakoram is the title of a lecture delivered on November 24th, 1913, to the Royal Geographical Society, by Mrs. F. BULLOCK WORKMAN.¹ It tells the same story as the book quoted above. After the paper Sir FRANCIS YOUNGHUSBAND stated that Dr. and Mrs. Workman had explored the Siachen Glacier »to its extremities, and mapped scientifically and accurately, so that we now have a full and detailed description of this remarkable glacier. I desire to congratulate Mrs. and Dr. Hunter Workman on the very fine work they have accomplished, and on the highly valuable scientific results they have attained, and which could not have been accomplished without great care of organisation

¹ *Geogr. Journal*, February 1914, p. 117 *et seq.*

before they started, without extreme persistence and pluck while on the journey, and without further elaborate working out when they came back.»

Dr. LONGSTAFF added some details and gave an interesting summary of the roads to Turkestan.

He suggests the existence of »another unknown and very lofty mountain group somewhere to the north-east of Teram Kangri, probably in the Remu area as indeed I might have inferred from a letter I received from Colonel Godwin-Austen. Extreme difficulties of access have so far kept the geographical secrets of this north-eastern region of the Karakoram hidden from our view».

Sir MARTIN CONWAY on the same occasion certainly expressed the feelings of most geographers when he said: »If there did exist any ill-tempered critic desirous of making the worst that he could of the work in the mountains of the Karakorams of Dr. and Mrs. Workman, he would, after saying his worst have to make certain admissions. He would be compelled to allow that, during the best part of fifteen years, they had devoted a great portion of their time to the serious study of this enormous mountain region. He would be obliged to say that they had undertaken expedition after expedition of the most arduous kind; that they had carried those expeditions through with ever-increasing ability, increasing elaboration, and with the increasing success which comes from accumulated experience. He would be obliged to say that the map of this part which was in an unsatisfactory state, over a considerable portion of it, has, since their visits, been filled out with detail which is obviously truthful, that they have added, therefore, enormously to our knowledge of the greatest knot or group of mountains on the face of the Earth.»

It is refreshing to read such words of loyal praise by one of the most noble and experienced mountaineers who ever surveyed in the Kara-korum.

CHAPTER LIV.

SIR SIDNEY BURRARD.

Colonel BURRARD in 1907 classified the high ranges of Asia into seven groups, of which the first includes ranges of the first magnitude carrying many peaks above 25,000 feet, and which includes but two, namely The Great Himalaya in Nepal, and the Kara-korum. To his second class of ranges carrying many peaks above 22,000 feet, belong the following four: The Great Himalaya in Kumaun, the Hindu-kush, the Kwen-lun and the Kashgar Range. In his third class, with many peaks above 19,000 feet, we find, amongst others, his Kailas Range and Ninchin-thangla Range.¹

Regarding the Kara-korum, Burrard makes some very important remarks. Already on the Frontispiece map to Part I we recognize the four ranges of Dr. A. NEVE. There is YOUNGHUSBAND'S Aghil Range, which on BURRARD'S map is stretching the whole way through Tibet, south of Mekong, a view which I believe is correct with the only exception that its eastern half certainly runs farther north, and even north of the Yang-tze River. His second range is the Kara-korum Range also stretching through the whole of Tibet, in its eastern part keeping south of the Salwen. This is the range or rather system which I believe is in connection with the Tang-la of HUC, which goes between Mekong and Salwen.

His third range is the Kailas Range, the eastern prolongation of which is, at any rate, partly situated where I have my Transhimalaya. We do not need to deal with his fourth range, the Ladak Range, but rather quote what he says of the third one, a view which is also in accordance with my results:

From Manasarowar the Kailas range can be traced along the north bank of the Indus as far as the Pangong lakes. In longitude 80° it is intersected by the Singhgi, the eastern branch of the Indus. On reaching the Pangong lakes it appears to end in the peak of Sajum (20,018 feet), but farther west it can be traced again, and then forms the water-parting between the Shyok on the south and the Nubra on the north: the alignment from Sajum to the junction of the Nubra and Shyok has not been determined, and the

¹ *A sketch of the Geography and Geology of the Himalaya Mountains and Tibet* by Colonel S. G. Burrard and H. H. Hayden, Part. II. Calcutta 1907, p. 71 *et seq.*

range has been broken on the frontispiece to Part I to denote uncertainty.¹ It is possible that the Kailas range has clashed with the Ladak west of Sajum peak, and that for a short length the two ranges are here welded together. It is also possible that vertical subsidences have destroyed the continuity of the Kailas near Pangong. West of the junction of the Nubra and Shyok the Kailas range runs parallel to its northern neighbour, the Karakoram; the long troughs occupied by the Biafo, Hispar and Chogo Lungma glaciers lie between the Kailas and Karakoram ranges.²

Though in 1910 I quite agreed with Sir Sidney Burrard in his proposal to abolish the name Mus-tagh which is given to a certain part of the Western Kara-korum, I now think, after a more careful consideration, that YOUNGHUSBAND is quite right in his wish to establish the name.³ It does not matter in the least that it is no *nomen proprium* at all, but simply a signification used for all Ice Mountains, but in these regions it was known to Europeans for 200 years. It is, therefore, of historical value and should not be abolished by European map-makers. Whatever may be determined in Europe, the name will always remain alive amongst the natives. The surroundings of K2 and the great glaciers will always be the Mustagh *par préférence*, and only to that region, or the High Kara-korum, should it be attached. The opinion of YOUNGHUSBAND, the only man who so far has crossed the Mustagh Pass, must be regarded as of great weight.

Burrard regards the Kara-korum and the Hindu-kush as different sections of the same crustal fold. He proposes to call the part of the chain which is situated in Tibet and Hunza the Kara-korum, and the portion which falls within Gilgit, Chitral and Afghanistan the Hindu-kush. The dividing line would thus be formed by the water-parting between the Hunza and Gilgit rivers.

The Shyok, Hunza, Gilgit and Kunar rivers drain the trough *behind* the Karakoram range; the Nubra river rises *in* the Karakoram, the glacier at its source having cut a notch in the crest-zone.... A length of 104 miles of the Karakoram crest carries great peaks against one of 93 miles of the Great Himalaya. The Karakoram rises as it leaves Tibet, culminates in K₂, and then slowly declines: its crest does not show the surgings of the Great Himalaya.

Of very great importance and interest are Col. Burrard's views regarding the eastern extension of the Kara-korum. Whereas the western termination of the chain is the Hindu-kush, he says that »of its eastern termination we know nothing«. It is true that the Aling Kangri has been supposed to mark the continuation of the Kara-korum fold, but between the well-known eastern extremity of the chain near Pangong and Rudok, and the Aling Kangri, no range is so far known to exist. This part of the country is, however, very little known. Burrard suggests that here a portion of the Kara-korum may have subsided vertically, an opinion in which I believe he is right. The superficially missing link of the chain does not, of course,

¹ This is the gap of which I have spoken above.

² Op. cit., p. 95.

³ *Geographical Journal*, August 1910, p. 193.

interfere with the fact that what Burrard calls the Kailas Range must anyhow be regarded as the prolongation of the same fold. When Burrard reminds us of the fact that in this case perhaps only 1,000 or 2,000 feet rise above the surrounding alluvial plains, he touches an arrangement which is very common in other parts of Tibet, where the alluvial and aeolian deposits hide the solid rock skeleton beneath, and make it difficult to follow the different ranges. As I have set forth before, I do not believe, however, that the eastern continuation from Aling Kangri is the same as Nain Sing's »almost continuous range of snow mountains, trending the whole way to Nien-chen-tang-la».

Col. Burrard leaves the question of the existence of a second Kara-korum Range, the one with the Kara-korum Pass, as unsettled. He has not marked such a second range on his frontispiece map, so his four ranges are not quite the same as those of Dr. A. NEVE. Burrard asks: »What is this water-parting? Is it a fold of the Earth's crust? Is it an easterly continuation of the northern Hindu Kush fold, and has it been welded by pressure into the Kara-korum at K 2?» He finds it impossible to answer these questions, its existence as a crustal fold is conjectural, »and it would be unsafe to draw conclusions as to structure from observations of drainage».

For my own part I cannot imagine that the configuration around the Kara-korum Pass can be the work of drainage alone. Still less can this be the case with the surroundings of Chang-lung-yogma. The Lanek-la is more levelled, but probably indicates the continuation of the northern system, which may be traced far into Tibet where its different sections have been crossed by several travellers. In my opinion Dr. A. NEVE'S view is correct as shown on his diagram.¹ It is also made clear from Dr. Longstaff's sketch-map.² But the important results of these two alpinists were published three years after Burrard's »Sketch», and Burrard was quite aware of the possibility of such an arrangement, — therefore he wisely left the question open to discussion. Burrard, however, has made the important observation that the great Kara-korum peaks seem to follow two alignments. The Masherbrum peaks surmount a ridge parallel to that on which the K 2 and Gasherbrum stand.

Regarding the Kara-korum in its relation to the Aghil and Kwen-lun Systems, Burrard correctly suggests that these folds may have been pressed against one another: »all the ranges of Tibet tend to converge at the north-western corner of the plateau, as though they were trying to escape through the neck of a bottle; once having passed the neck they separate again, but during the passage they appear to suffer from extreme compression».

The relations of the ranges of Western Tibet to those of Eastern Tibet, Burrard expresses very well in the following passage: »On the west of Tibet we find,

¹ *Geographical Journal*. November 1910, p. 575.

² *Geographical Journal*. June 1910, p. 625.

between the Kailas and the Kuen Lun ranges two primary ranges, the Karakoram and the Aghil: on the east we have five, the Lani, the Ninchinthangla, the Tangla, the Dungbura and the Kokoshili.... How the two become five, or whether there are not more than five we do not know.¹ The ranges of Eastern Tibet are indeed more numerous. Disregarding those ranges which belong to the Kuen-lun System, namely Astin-tagh, Akato-tagh, Chimen-tagh, Ara-tagh, Kalta-alaghan, and the several Arka-tagh Ranges, in all ten ranges, we have sixteen more ranges down to $31\frac{1}{2}^{\circ}$ N., which I crossed in 1901, namely two Koko-shili Ranges, three Dungbure, one Bukamagna, three Tang-la Ranges, and seven Chang Ranges.² On a sketch-map I laid down these ranges so far as they could be followed when all the material existing then was used. Some of these ranges seem to disappear as they proceed westward, the first at 86° E., others at 84° , 82° and 80° , approximately. The Kara-korum Ranges, as said before, no doubt continue through the southern half of Tibet, whereas the relation between the Aghil Range and other ranges north of it, — and the Arka-tagh and other ranges, near it, will be extremely difficult to clear up, at the present moment even impossible, as the country just north of the central section of WELLBY'S route is unknown.

Under the heading *Prolongation of the Kara-korum in Tibet* BURRARD further says:³

The prolongation on the frontispiece (chart) of the Karakoram range and its conjunction in longitude 92° with the Ninchinthangla are hypothetical. We do not yet know that the Karakoram range does continue eastwards through Tibet, and even if it be proved to do so, it may be found to connect with the Tangla range north of latitude 32° , and not with the Ninchin-thangla. Observers of the Himalaya, the Ladak and the Kailas ranges have been impressed with their apparent continuity, and it is perhaps natural that we should seek for the prolongation of the gigantic Karakoram: the prolongation, however, as entered on the chart, is intended to suggest only the *possibility* of continuity, and must not be accepted as fact.

His representation of the Tibetan stretching of the Kara-korum, Burrard has based upon the PUNDITS' observations from 1867 and upon NAIN SING'S snowy range south of this route in 1874. The Ladak Range goes between the Indus and the Panggong-tso, and Burrard suggests that possibly the Kailas Range also passes between them. »The Aling Kangri peaks are now believed to stand considerably north of the Kailas and Ladak Ranges, and to mark perhaps the continuation of the Kara-koram». Accepting Dr. A. NEVE'S two principal Kara-korum Ranges we have only to interpret Burrard's view thus: the southern great Kara-korum, no doubt, continues in the Aling Kangri and Transhimalaya the whole way beyond Nien-chen-tang-la whereas the northern reappears in HUC'S Tang-la Range.

¹ Sketch etc., p. 110.

² *Scientific Results of a Journey in Central Asia 1899-1902*. Vol. IV, p. 579. Stockholm 1907, the same year in which Burrard's work was published.

³ Op. cit., p. 111.

HYDROGRAPHY, OROGRAPHY
AND
GEOMORPHOLOGY OF TIBET

CHAPTER LV.

THE SELF-CONTAINED BASINS OF TIBET.

The 1:1000000 map of Tibet and Eastern Turkestan which accompanies this work, and with which Colonel H. BYSTRÖM has been busy for some 10 years, has made it easier to me than heretofore, to get a comprehensive view of this enormous portion of the interior of Asia. With the assistance of this important map I have studied some of the characteristic features of Tibet, from orographic, geo-morphological and hydrographical points of view. The following chapters are dedicated to these questions, and may therefore be regarded as an addition to the part of my former scientific work which I call: *Orography of Central Tibet*.¹

In the present chapter I will give an idea of the size of the greatest lakes and the areas of the largest basins which are without an outflow to the sea or to Eastern Turkestan and Tsaidam.

The table on this and the next page contains the lakes and basins which are sufficiently well known for an approximate calculation. In the first column is entered the name of the lake; in the second and third the approximate latitude and longitude; in the fourth the absolute altitude of the lake; in the fifth the area of the lake; in the sixth the area of its drainage basin; in the seventh the name of the discoverer; and in the eighth the relation between the lake and its drainage basin.

Table of Lakes and self-contained Basins.

Name	Latitude	Longitude	Altitude in meters	Area of Lake in sq. km.	Area of drainage in sq. km.	Discoverer	Proportion between Lake and Basin
Salt marsh	35° 25'	79° 30'	4663	40	1850	Johnson	$\frac{1}{40}$
Aksai-chin	35° 10'	79° 50'	4914	50	6850	Johnson	$\frac{1}{137}$
Lighten Lake	35° 0'	81° 5'	5095	245	3925	Wellby	$\frac{1}{16}$
Yeshil-köl	34° 55'	81° 35'	4945	45	3525	Kischen Sing	$\frac{1}{78}$
Pool-tso	34° 50'	81° 58'	5077	38	950	Deasy	$\frac{1}{25}$
Lac de l'antilope	35° 55'	86° 50'	4920	175	2825	de Rhins	$\frac{1}{16}$
No. II	35° 57'	87° 30'	4900	28	1075	Hedin	$\frac{1}{38}$
No. XI	35° 55'	88° 50'		52	1100	Hedin	$\frac{1}{21}$
No. XV	35° 48'	89° 24'	4896	60	1800	Hedin	$\frac{1}{30}$

¹ *Scientific Results*, Vol. IV, Stockholm 1907, p. 535—608.

Name	Latitude	Longitude	Altitude in meters	Area of Lake in sq. km.	Area of drainage in sq. km.	Discoverer	Proportion between Lake and Basin
No. XVI	35° 45'	90° 5'	4932	95	2 075	Hedin	$\frac{1}{22}$
No. XVII	35° 38'	90° 32'		11	550	Hedin	$\frac{1}{50}$
No. XVIII	35° 38'	90° 55'	4920	247	2 100	Hedin	$\frac{1}{8}$
No. XIX	35° 32'	91° 47'	4810	130	2 800	Hedin	$\frac{1}{22}$
No. XX	35° 45'	92° 42'	4616	200	4 575	Hedin	$\frac{1}{23}$
Achik-köl	37° 5'	88° 20'	4365	250	12 200	Kosloff, Bogdanovitch	$\frac{1}{49}$
Ayagh-kum-köl	37° 32'	89° 15'	3867	725	26 550	Prshevalskiy	$\frac{1}{37}$
Salt Lake (Ling-shi-tang) .	34° 55'	79° 19'		40	3 075	Johnson	$\frac{1}{77}$
Lake ENE of Chang-lung-yogma	34° 41'	79° 42'		18	2 625	Hayward	$\frac{1}{145}$
Tsaggar-tso	34° 35'	80° 29'		110	950	Kishen Sing	$\frac{1}{9}$
Arport-tso	34° 30'	81° 4'	5298	137	1 100	Bower	$\frac{1}{8}$
Lake Markham	35° 3'	83° 10'	5023	187	5 275	Rawling	$\frac{1}{28}$
Salt Lake	35° 25'	84° 38'		44	2 900	Wellby	$\frac{1}{66}$
Lac des Roches Rouges .	35° 43'	87° 15'	4884	162	1 700	de Rhins	$\frac{1}{10}$
Salt Lake	35° 25'	88° 13'	4804	70	3 200	Wellby	$\frac{1}{46}$
Salt Water Lake	35° 19'	89° 13'	4962	187	2 875	Wellby	$\frac{1}{15}$
Large Fresh W.L. + Salt L.	35° 12'	90° 10'	4766	117	3 375	Hedin	$\frac{1}{29}$
Shemen-tso	34° 2'	81° 42'	4960	250	3 625	Bower	$\frac{1}{14}$
Lashung-tso	34° 6'	85° 5'		42	525	Hedin	$\frac{1}{12}$
Gomo-tsaka	33° 45'	85° 34'		137	2 350	Hedin	$\frac{1}{17}$
Lac No. 4	35° 52'	87° 12'	4830	100	1 000	de Rhins	$\frac{1}{10}$
Lac des Hemiones	35° 8'	86° 48'	4950	562	3 150	de Rhins	$\frac{1}{6}$
Lac des Yaks	34° 53'	87° 12'	4755	65	1 200	de Rhins	$\frac{1}{18}$
Lac du Cratère	34° 38'	87° 11'		65	675	de Rhins	$\frac{1}{10}$
Lacs Jumeaux	34° 30'	86° 59'	5121	145	2 500	de Rhins	$\frac{1}{17}$
Lac d'ammoniaque	32° 37'	86° 5'	4706	62	1 125	de Rhins	$\frac{1}{18}$
Large Lake	34° 32'	88° 32'		150 (?)	7 550	Hedin	$\frac{1}{50}$
Salt Lake	34° 52'	90° 14'	4847	235	3 625	Hedin	$\frac{1}{15}$
Lake	33° 16'	89° 18'	4972	147	4 225	Hedin	$\frac{1}{29}$
Chib-chang-tso	33° 27'	90° 3'	5300	275	6 375	Rockhill	$\frac{1}{23}$
Panggong-tso	33° 45'	78° 40'	4317	275	15 000	Moorcroft (1821)	$\frac{1}{35}$
Dagtse-tso	31° 53'	87° 25'	4544	137	7 700	Bower	$\frac{1}{56}$
Selling-tso	31° 44'	89° 0'	4611	1825	32 775	Bower	$\frac{1}{18}$
Nganglaring-tso	31° 37'	83° 7'	4746	550	6 650	Nain Sing	$\frac{1}{12}$
Shovo-tso	31° 22'	83° 23'	4784	87	3 075	Hedin	$\frac{1}{35}$
Poru-tso	30° 53'	83° 36'	5094	37	2 325	Hedin	$\frac{1}{63}$
Tarok-tso	31° 13'	84° 7'	4627	450	8 475	Hedin	$\frac{1}{19}$
Chunit-tso	31° 6'	84° 40'	4747	120	725	Hedin	$\frac{1}{6}$
Karong-tso	30° 52'	85° 0'		175	2 225	Hedin	$\frac{1}{13}$
Teri-nam-tso	31° 0'	85° 45'	4684	800	9 800	Nain Sing	$\frac{1}{12}$
Dangra-yum-tso	31° 0'	86° 30'	4646	950	9 975	Nain Sing	$\frac{1}{10}$
Shuru-tso	30° 15'	86° 30'	4725	120	3 450	Hedin	$\frac{1}{25}$
Ngangtse-tso	31° 10'	87° 3'	4694	375	5 425	Nain Sing	$\frac{1}{14}$
Marchar-tso	31° 3'	87° 21'		113	2 200	Nain Sing	$\frac{1}{19}$
Kyaring-tso	31° 10'	88° 15'		575	12 400	Nain Sing	$\frac{1}{22}$
Mokieu-tso	30° 58'	89° 0'		350	3 000	Nain Sing	$\frac{1}{9}$
Tengri-nor	30° 45'	90° 30'	4630	1900	11 100	Chinese Lama Surveyors	$\frac{1}{8}$

The first five lakes of our table are situated at the southern foot of the principal Kwen-lun Range; the same that acts as a water-parting between the Tarim Basin to the north and the self-contained¹ area of the Tibetan plateau-land to the south. The lakes are therefore, as a rule, fed by the melting snows and glaciers of the same range, and, generally, each lake is situated in the southern part of its basin, as could be expected from morphological reasons. Only Yeshil-köl may be said to be placed in the midst of its very irregular basin, while the Pool-tso which is separated by the latter from the Kwen-lun, is situated in the N. W. part of its basin. All these lakes with the exception of the Yeshil-köl only, are situated near the western edge of their basins, Lake Aksai-chin and Lighten Lake being only at a few kilometers from the latter. The basins of the two last-mentioned lakes are the largest, being 6850 and 3925 square km. respectively.

The eastern neighbour of the Yeshil-köl basin is unknown, though DE RHINS, WELLBY, RAWLING and I have crossed it in its western and southern portions. This basin seems to be of considerable size. Then follows, still farther eastwards, a rather large area of *terra incognita* stretching to 86° E. Long., where I crossed it in 1896. To the north it is bounded by the Kwen-lun border ranges, and to the south by the route of WELLBY and MALCOLM in 1896. Very likely there are several lakes to be found in this region, so much the more so as Lac de l'Antilope, Lac des Corbeaux and my chain of lakes from No. I to No. XX of 1896 must be regarded as probably situated along the southern basin of the Kwen-lun proper and in the same latitudinal² valley as the Yeshil-köl.

As appears from the table, the group of eastern Kwen-lun lakes just mentioned is characterized by comparatively small basins and comparatively large lakes. The largest of the latter, No. XVIII, is nearly of the same size as Wellby's Lighten Lake. The largest basin is the one of Lake No. XX, having 4575 square km. My lakes No. XXI and XXII certainly belong to the self-contained area of Tibet. East of them begins the region with drainage to the Yang-tse River. The lake which I only saw at a distance in 1896 and which was discovered by CAREY and DALGLEISH in 1886 may possibly belong to the self-contained area of the Tibetan plateau-land. If this be the case we know 31 lakes along the southern base of Kwen-lun proper.

In the northernmost region of the Tibetan highland the Kwen-lun System spreads out like a fan or like the fingers of an open hand. One of its branches, the Kalta-alaghan (or alakan), is of special importance as being the water-parting to Eastern Turkestan. South of it and of its south-western continuation we find a

¹ By the term »self-contained» I mean a basin that has no outlet to the sea, nor, in the case of Tibet, to Eastern Turkestan and Tsaidam.

² By a »latitudinal» valley I mean the long depression or folding-trough that is situated between two mountain ranges or systems, and therefore, as a rule, parallel to the latitudes. I never use the term longitudinal valley. Valleys crossing a range or system I call transverse valleys.

few lake basins or depressions which, therefore, are situated in the midst of the Kwen-lun System. Two of these basins are considerably larger than the average basins along the southern foot of the system, and one of them, that of the Lake Ayagh-kum-köl, belongs to the very largest of the whole plateau-land. It has an area of 26,550 sq. km., whereas the other basin, that of Achik-köl, is not half as large, or 12,200 sq. km. Comparing the absolute altitude of these two lakes with that of one of the southern Kwen-lun lakes, for instance No. II, we find how the lake basins of this part of Tibet gradually become lower from south to north, No. II having an altitude of 4900 m., Achik-köl of 4365 m., and Ayagh-kum-köl of 3867 m.

The next series of lakes is not quite as sharply defined as those along the base of the Kwen-lun, though here the route of Wellby and Malcolm is of great assistance. To the same series belong some lakes described by DEASY, RAWLING, DE RHINS, LITTLEDALE and myself. Some of the most important, in all ten, are entered in my list. Their basins are as a rule comparatively small, that of Lake Markham¹ being the largest with an area of 5275 square km. As to the proportion between the area of the lake and the area of its drainage basin, no general rule can be traced. In one case, *viz.*, the little lake to the E. N. E. of Chang-lung-yogma, its area is only $\frac{1}{14}$ of its drainage basin, while my lake No. XVIII as well as Arport-tso are $\frac{1}{4}$ of their drainage basins.

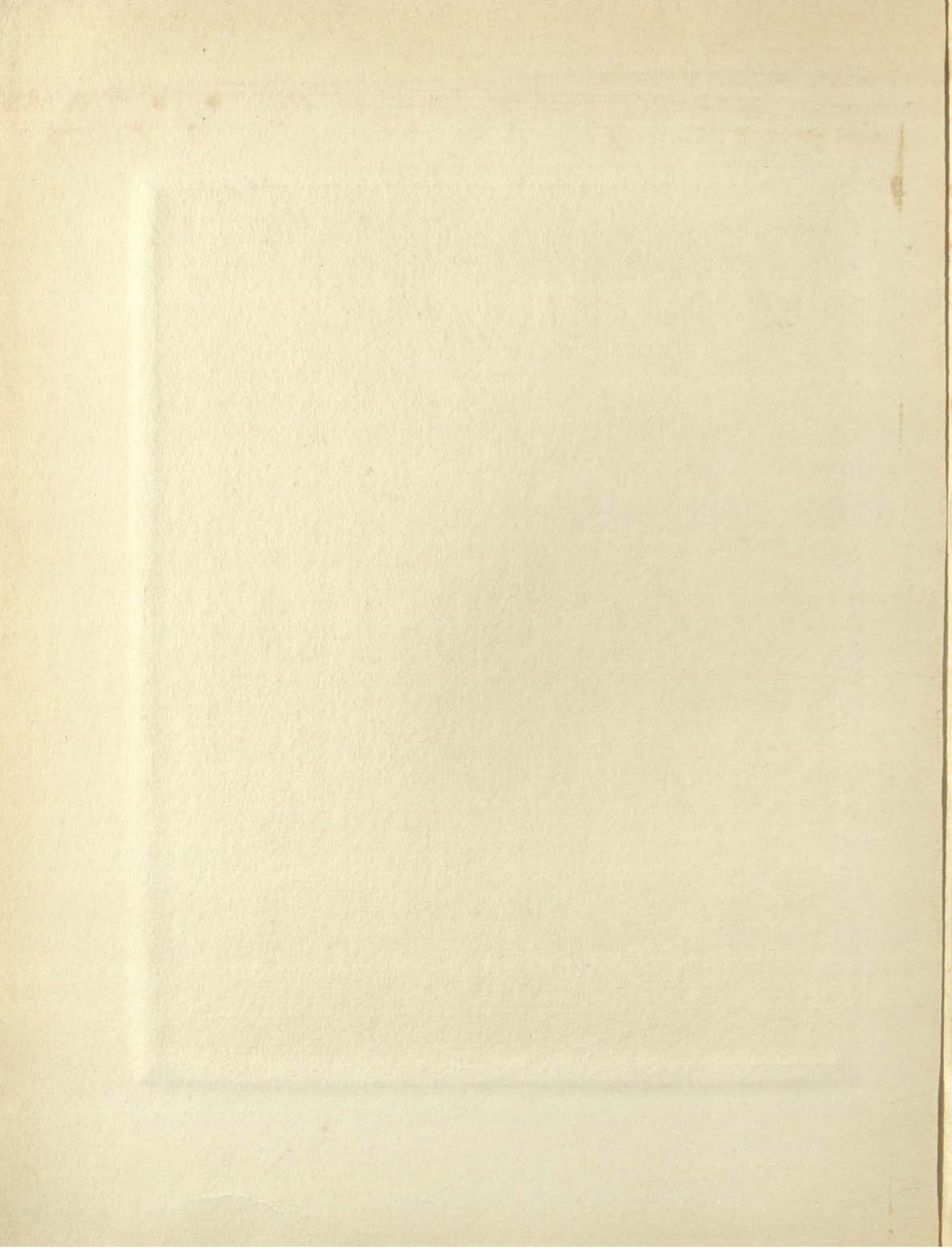
Proceeding one step farther south I have calculated the areas of thirteen lakes and their basins, all belonging to the central parts of the plateau-land. The number of such lakes is of course very great, though I have only chosen those the surroundings of which are fairly well known. They are not bounded by a latitudinal valley between two mountain systems, but are only taken at random here and there in the central parts of Tibet. The largest of these lakes is the one called Lac des Hemiones by de Rhins and having an area of 562 sq. km. according to his map. Both its form and its size are, however, doubtful, especially as DE RHINS and GREARD call its northern half No. 5 and its southern half No. 6. Probably it is two lakes, perhaps one fresh and one salt, as is an ordinary combination on the plateau-land. The largest drainage basin of the group in question, *viz.*, the one I discovered in 1901, has an area of 7550 sq. km. Here the relation between the lake and its drainage area is as 1:50, whereas the same relation in the case of Lac des Hemiones is 1:6. Of course, these figures are only approximate.

The next series of lake basins shows a high degree of continuity. It begins in the west with Panggong-tso and comes to an end in the east with Selling-tso.

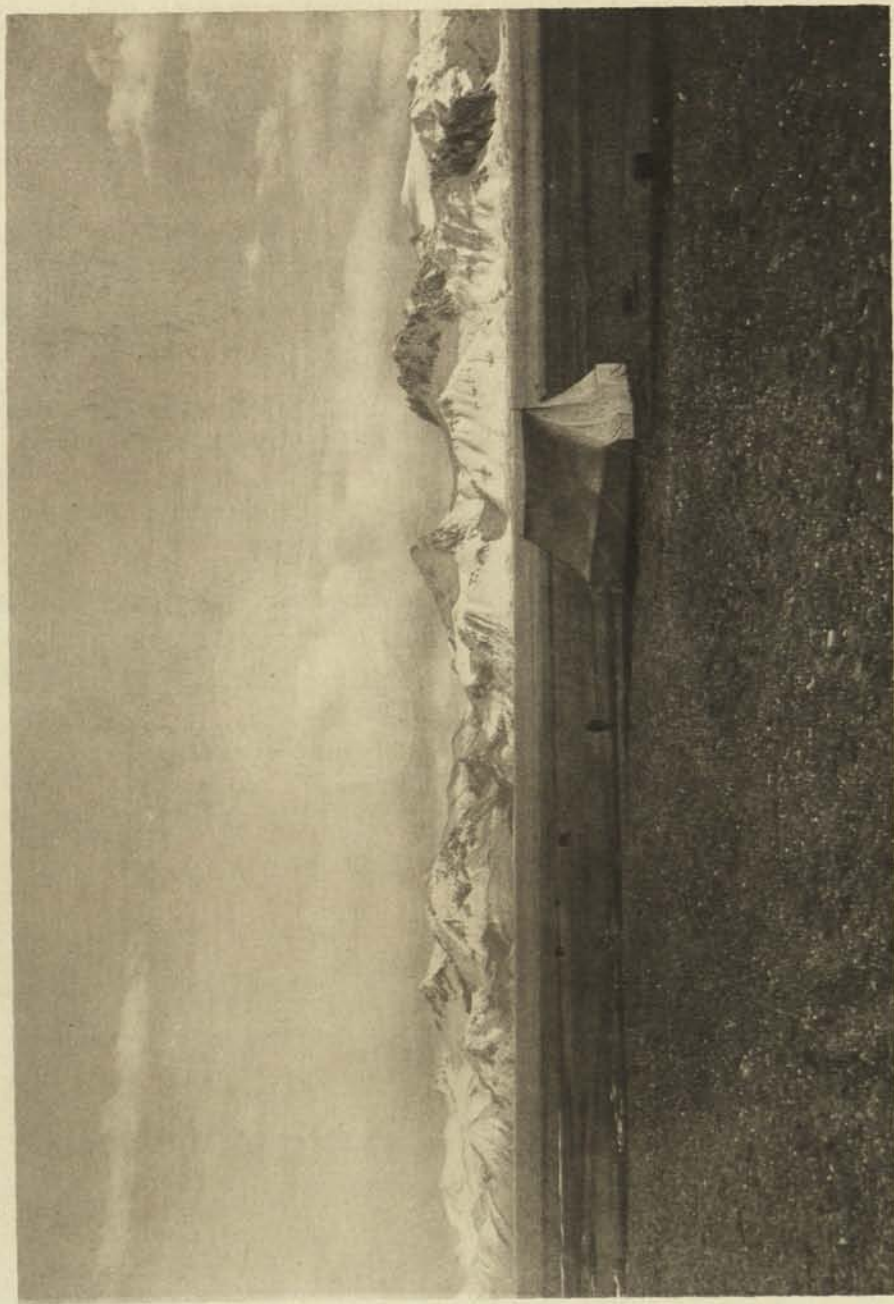
¹ I am principally against the habitude of some explorers to baptize lakes and mountains with European names, but as the names already given are entered upon all European maps I cannot help using them. My views in this question are explained in a little article: European names in Tibet, *Geografiska Annaler*, Stockholm 1920, p. 363 *et seq.*



LOOKING E. S. E. FROM CAMP 9.



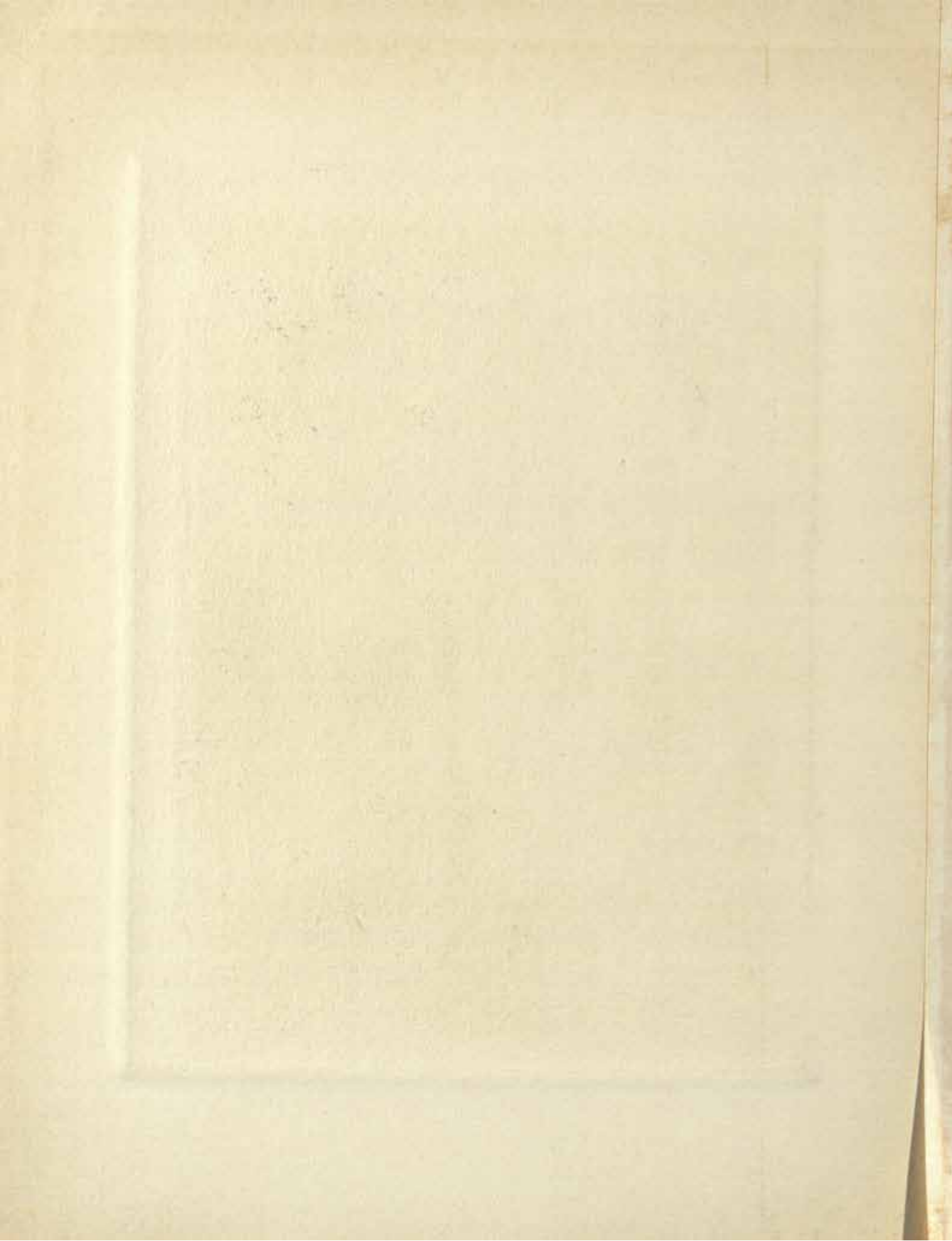
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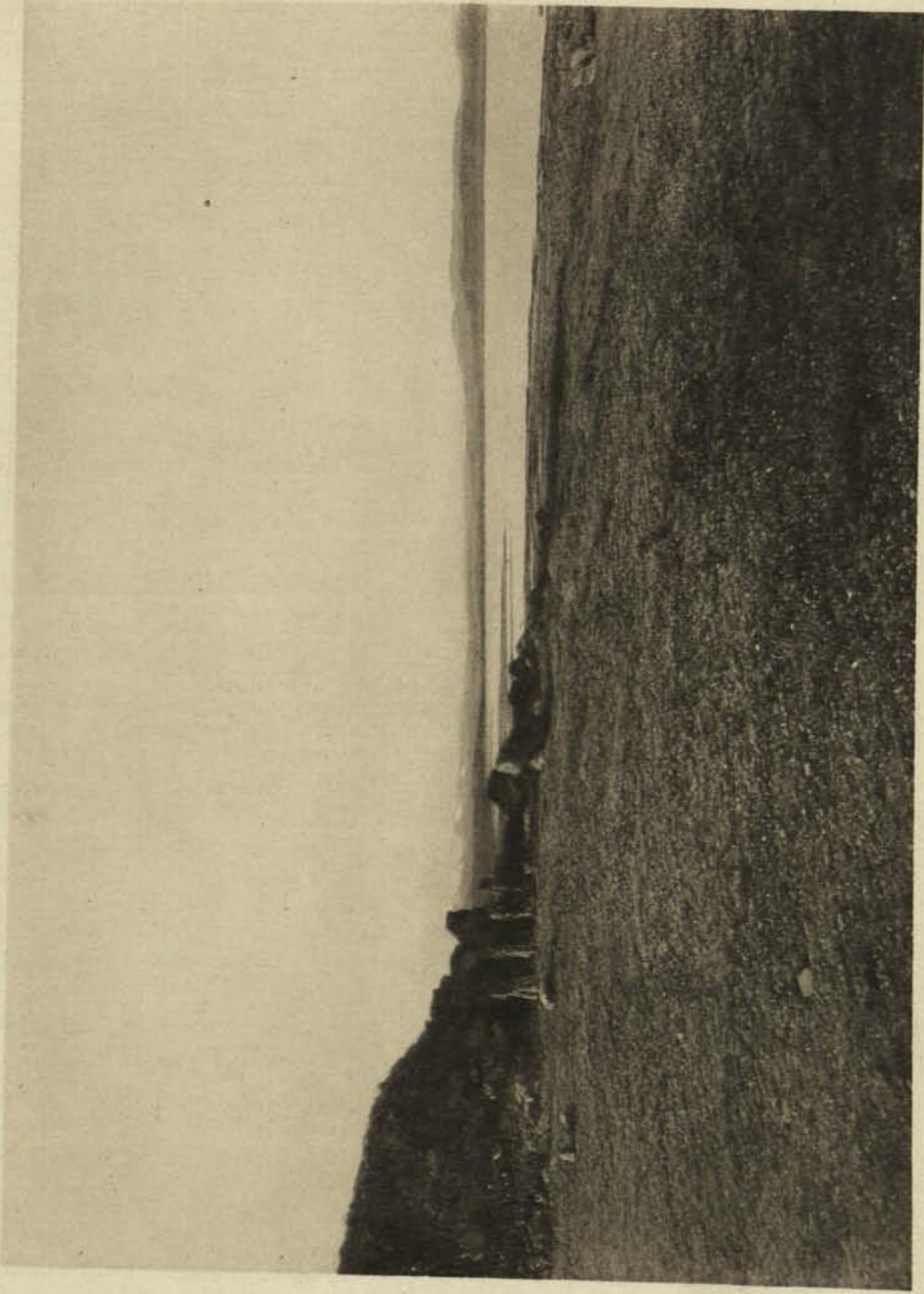
THE RANGE SOUTH OF LAKE LIGHTEN. LOOKING S 30° E FROM CAMP 15.



THE RANGE SOUTH OF LAKE LIGHTEN. LOOKING S 10° E FROM A POINT NEAR CAMP 15.

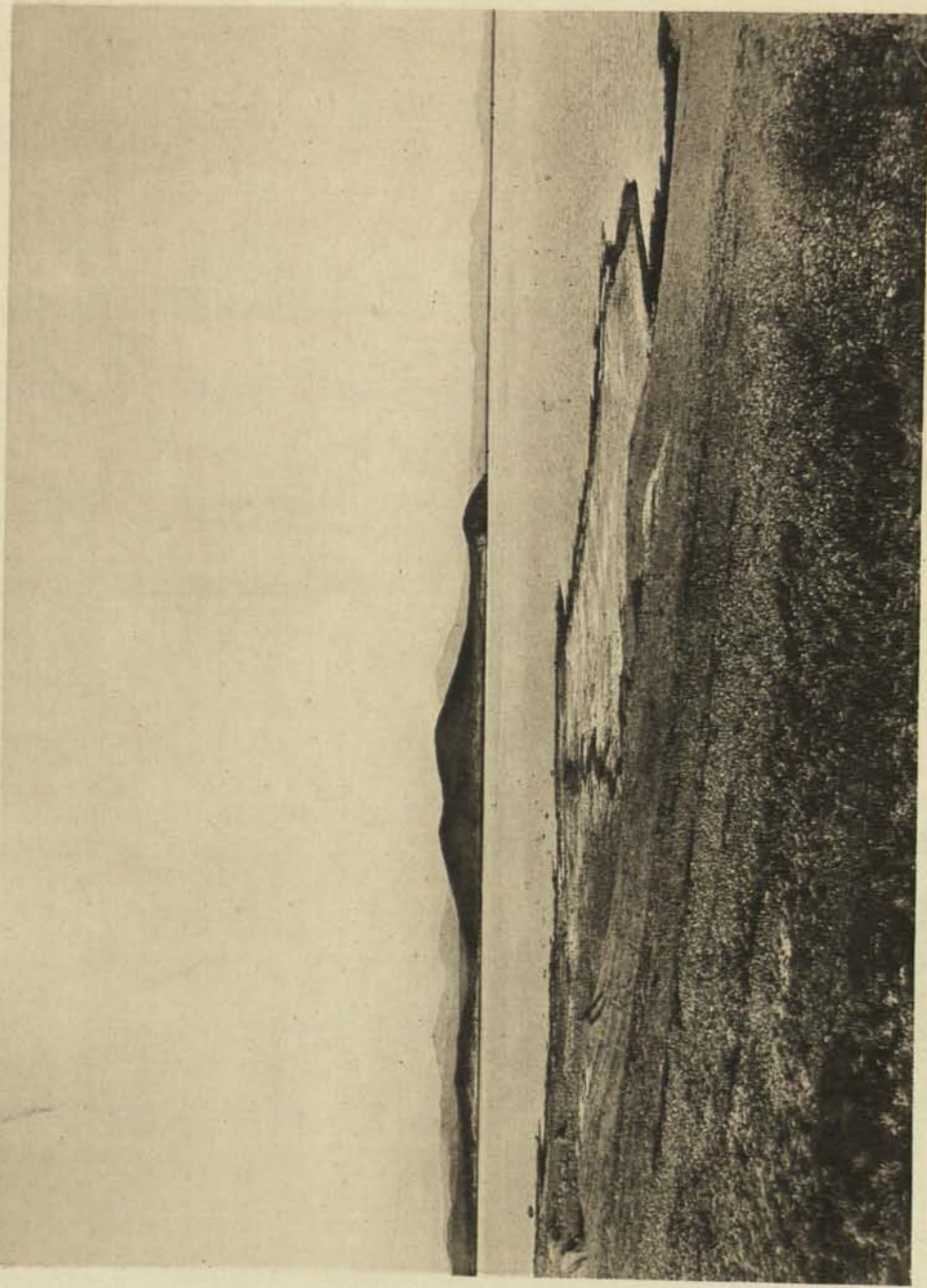


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THE POOL-TSO. LOOKING N 6° E FROM CAMP 23.

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THE POOL-TSO. LOOKING N 53° E FROM CAMP 23.

I have entered in the list only these two and Dagtse-tso as other lakes belonging to the same group, as *e. g.* Lakor-tso, Tongka-tso and Tashi-bhup-tso, are too little known so far as their drainage areas are concerned. All three of these basins are large, the third of them, Selling-tso, being the largest in all Tibet, with an area of 32,775 sq. km.

Finally we come to the southernmost chain of lakes within the self-contained area of Tibet. In the table I have entered fourteen of them, of which seven were discovered by NAIN SING, six by me and one, Tengri-nor, has been known for 200 years. Except one, the Shuru-tso, they are all situated along the northern base of Transhimalaya in the same way as the Kwen-lun lakes are situated along the southern base of the Kwen-lun. As nearly every one of the latter are situated in the southern part of their respective drainage basins, so the Transhimalayan lakes are, as a rule, placed near the northern edge of their respective basins. One of these lakes, the Tengri-nor, being 1900 sq. km. in size, is the largest of all lakes in Tibet; the Selling-tso with 1825 sq. km. being the second. Several of the drainage basins are comparatively large, those of the Tengri-nor and Kyaring-tso having an area of resp. 11,100 and 12,400 sq. km., and those of the Tarok-tso, Teri-nam-tso, and Dangra-yum-tso, being from 8500 to 10,000 sq. km. in size. Nearly all these lakes, perhaps with the exception of Marchar-tso, Shuru-tso and Chunit-tso, are fed by more or less considerable rivers from the great water-parting¹ of the Transhimalaya, a fact which in no small degree is due to the comparatively abundant precipitation of the south-west monsoon caught by the Transhimalayan ranges. Still, in this connection it should not be forgotten that the largest river of the self-contained Tibetan plateau-land does not take its origin from the Transhimalaya, but from the southern side of the Tang-la, *vis.*, the Sachu-tsangpo, the drainage area of which is also the largest of Tibet, or nearly 33,000 sq. km.

The area of the self-contained plateau-land of Tibet, *i. e.* the region that has no outflow to the ocean, to the Tarim Basin or Tsaidam, is, according to my calculation from Colonel H. BYSTRÖM'S map in 1:1,000,000, in all 717,800 sq. km., which is not quite as large as the Scandinavian peninsula (Sweden and Norway together 772,140 sq. km.).

The whole area of the basins entered in the list given on p. 493, amounts to 276,050 sq. km., or more than one third of the whole area. To give a list of all the basins of which the whole Tibetan plateau-land consists and which form a complicated mosaic work or »puzzle», is of course impossible with our present knowledge of the country. In my list I have only entered such basins as may

¹ By the great water-parting of the Transhimalaya I mean the line on the northern side of which the water flows to Tibet, whereas to the south it goes to India. To call it »the continental water-parting» is not quite correct. On the northern side of the eastern section of Transhimalaya the water has an oceanic outflow. Here, however, we are only concerned with the Central Transhimalaya.

be regarded as fairly well explored, although all of them would naturally have to undergo considerable corrections on a large-scale map.

The largest basins are Achik-köl, Ayagh-kum-köl, Panggong-tso, Selling-tso, Kyaring-tso and Tengri-nor, and we may feel pretty certain that no other basins of the same size remain to be discovered. But there are a large number of basins of the same size as the moderate or small ones in the table. If now the 56 basins of the table cover 276,050 sq. km. together, would it be likely that the number of basins covering the remaining 441,750 sq. km., not considered in the table, would be proportionate to those calculated? Or, in other words, that the self-contained area of Tibet would consist of 145 basins altogether? No, by no means! For my table contains only large well-defined basins, and between them there are certainly several hundreds, perhaps thousands of very insignificant basins.

As to the distribution of the basins it should be noticed that all the six largest basins are situated at the very edge of the Central Asiatic water-parting, and that the interior parts of the self-contained area are occupied only by moderate, small or insignificant basins. Even in the list where the examples are taken at random all over the area without outflow, we find the following law clearly expressed: the smaller the basins the greater their number. Only 2 basins are above 25,000 sq. km. in size; from 10,000 to 25,000 there are 4; from 5000 to 10,000 there are 10; from 3000 to 5000 there are 12; from 1000 to 3000 there are 21. Of those less than 1000 sq. km. in size I have entered only a few in the list. A look at the map in 1:1,000,000 will persuade the reader that their number could easily be augmented to a hundred or more, to which must be added all the still unknown basins. From the data given above I estimate that the number of basins with an area of more than 1000 sq. km. amounts to about 300, the basins from 1 to 1000 sq. km. being perhaps one or two thousand or even more.

Regarding the lakes the same law prevails. There are only 2 lakes of more than 1800 sq. km.; 6 have from 500 to 1800; 11 from 200 to 500; 18 from 100 to 200; and 19 less than 100. In reality there are innumerable insignificant pools on the Tibetan plateau-land.

In basins where water runs from a fresh-water lake to a salt lake, my list only considers the area of the latter. A special category of lakes are those in a dying state, as *e. g.* Tabie-tsaka. Some lakes are intermittently and only temporarily fed by rains.

The relations between the areas of lakes and their basins are not regularly proportional. Though the Tengri-nor has an area of 1900 sq. km., its drainage area is only 11,100 sq. km., whereas the Kyaring-tso with a drainage of 12,400 sq. km. is not quite one third of the Tengri-nor in size. Here, of course, everything depends upon the configuration of the ground, and the relations are of a purely geo-morphological nature. My lake No. XVIII for instance, is situated in a valley between two

mighty mountain ranges, and it therefore occupies $\frac{1}{8}$ of its drainage basin. On the other hand, my »Large lake» of 1901 which is situated on the flat and open plateau-land and which is surrounded by relatively low mountains at a considerable distance, occupies only $\frac{1}{10}$ of its drainage area.

A careful examination of Colonel Byström's map in 1:1000000, which is the most detailed and complete general map of Tibet in existence at the present date, will teach us that the lakes of the plateau-land are arranged in a certain degree of order, more especially in the northern and southern parts of the region. In the north we find two lines of lakes from west to east, *viz.*, the Kwen-lun lakes, including my chain of lakes No. V—No. XX and the lakes of Wellby with their western continuation. This regular arrangement of the lakes is of great assistance to us in our attempts to trace the situation and stretching of the principal mountain systems. For the lakes occupy the lowest parts of their basins, and a long series of lakes situated upon the same line, indicates a very extended depression. It is therefore natural, though not necessary, that a chain of lakes should be placed between two parallel mountain systems. In the same way Wellby's lakes let us suggest that their extended depression is bounded both to the north and south by parallel ranges.

In the south there are also two chains of lakes in depressions stretching through the whole plateau-land. In the northern one of these, to which Panggong-tso, Dagtse-tso and Selling-tso belong, NAIN SING, LITLEDAL and I have travelled. The southern one is marked by Nganglaring-tso in the west and by Tengri-nor in the east.

The most central part of the plateau-land situated between Wellby's lakes in the north and the Panggong-tso—Selling-tso Lakes in the south is not sufficiently well known to allow us to trace such long lacustrine depressions as those just mentioned. This innermost part of Tibet has been crossed only on five lines by BOWER, DE RHINS, LITLEDAL and myself. Our routes proceed from lake to lake, and it is probable that these lakes are also in reality placed upon more or less regular lines indicating long depressions between mountain ranges.

In my work *Scientific Results*, Vol. IV, p. 589 et seq. I have examined the absolute altitude of some 95 lakes discovered by NAIN SING, BONVALOT, BOWER, DE RHINS, LITLEDAL, DEASY, RAWLING, WELLBY and myself. As a mean altitude of 58 lakes in Eastern Tibet I got 4811 m., and as the mean altitude of 37 lakes in western Tibet 4837 m., and I therefore arrived at the conclusion that the mean altitude of the general plane of the plateau-land was somewhat higher in the west than in the east. This is probably correct and most likely is due to the fact that the mountain ranges are more closely pressed together in the west than in the east.

It is more interesting, however, to examine the mean altitude of the lakes which belong to the same latitudinal valley. Taking, to begin with, the 12 Kwen-lun lakes of our list, their mean altitude amounts to 4891 m. The 6 lakes of Wellby

and others in the next depression to the south, have a mean altitude of 4956 m. Calculating from 9 lakes of the central plateau-land the altitude of which is known, we get a mean altitude of 4938 m.

The next line of lakes is interesting. In my list I have entered only Panggong-tso, Dagtse-tso and Selling-tso. Adding seven other lakes, not entered in the list we get the following series:

Panggong-tso	4317 m.	Dshuvu-tsagga	4572 m.
Dshölu-chuga	4392 »	Lakkor-tso	4600 »
Tsolla-ring-tso	4440 »	Tongka-tso	4500 »
Jim-tso	4495 »	Dagtse-tso	4544 »
Oman-tso	4507 »	Selling-tso	4611 »

The mean altitude of these lakes is only 4498 m.! And as a rule the absolute altitude gradually increases from west to east, which, on this line at least, contradicts the previous conclusion that the western lakes should be higher than the eastern.

Considering finally the 10 Transhimalayan lakes of the list, we find that their mean altitude amounts to 4738 m. We have therefore a depression, Panggong-tso—Selling-tso, in the interior of Tibet that is no less than 440 m. lower than the average height of the depressions north of it and 240 m. lower than the depression of the Transhimalayan lakes. To this curious folding-trough as well as to the other depressions we shall return in a subsequent chapter.

CHAPTER LVI.

DIFFERENTIAL EARTH MOVEMENTS.

The general latitudinal orientation from west to east of the rivers and lakes on the Tibetan highlands is a very characteristic feature of the whole region. The four latitudinal valleys considered above, constitute continuous depressions which are to be explained as folding-troughs between the principal mountain systems. Even Nain Sing was struck by the continuity of one of these latitudinal depressions, and according to him a cart might be driven all the way from Noh to Ombo without any repairs being made to the road. This regular orientation of the lacustrine depressions will, as I have said above, prove to be of great assistance to us when we make the attempt to bring some order into the orography of Tibet, and the stretching of its principal mountain systems.

Before proceeding to this problem I will, however, say a few words on the geology of the region in question.

Ever since the middle Tertiary epoch, and even later, considerable tangential movements have taken place, according to SUESS, and these movements have folded the sea-bottom that stretched straight across Europe and Asia, while the table-land farther south did not take part in the movements. The whole southern rand of Eurasia is, as Suess says, pressed in gigantic folds towards Indo-Africa. The most magnificent of all these curved folds is the pair of systems called Himalaya and Transhimalaya, and the region of resistance which has forced the folds up like an enormous wall at the southern edge of Tibet, is the Indian peninsula.

Dr. H. AHLMANN has shown¹ how the orographic activity of the later tertiary epoch not only resulted in the formation of ranges of mountain-folds, but also in the elevation of the old sea-bottom which gradually was changed into a high-land plateau. This plateau forms the base of the mountain-folds. Further he proves that the destructive forces begin their work as soon as such a plateau block is formed. From the periphery the erosion of running water begins to cut down into the plateau block.

¹ Ymer 1918, p. 161.

By and by the latter is transformed into an accentuated mountain-land. The absolute altitudes decrease while the relative increase. But so far the mighty mountain systems at the edges of Tibet still protect the central parts of the country, though a time will come when the ramparts will have been pierced by the source branches of the great rivers and the destruction will proceed towards the heart of the plateau-land. The enormous valleys of the Indo-Chinese rivers show the direction in which the destruction goes on. This Dr. Ahlmann regards as the first stage of a destructive mountain-building cycle.

I will also enter here a few of the general conclusions drawn by the late Prof. A. HENNIG from my collections of specimens of rock, and described by him in Vol. V of the present work (p. 208 *et seq.*). He regards as certain that as early as in the beginning of Gault the Cretaceous sea became deeper and that therefore a transgression of this sea covered portions of Western and South-western Tibet which had formerly been dry land. During the Cenomanian period the same conditions prevailed. On the other hand it seems probable that South-west Tibet in the younger Cretaceous and older Tertiary epochs had risen above the surface of the sea, and at once became exposed to the weathering and eroding agencies. The material I brought home persuades Hennig that a very energetic mountain-folding action and a lively volcanic activity were at work perhaps already in the early Cretaceous and certainly in Eocene time, a time during which the formation of Transhimalaya and Himalaya began. Towards the end of the Pliocene and before the beginning of the Pleistocene period, the folding activity came to an end, after having built up the Transhimalayan and Himalayan folds. The weathering and erosive activity goes on uninterruptedly as well as does the deposition of detritus. The conglomerates and sandstones formed at that time and discordantly covering the Jura-Cretaceous formations, took part in the folding activity; the latter therefore continued far beyond the Eocene period. As the Pleistocene conglomerates in the valleys of the Brahmaputra and Satlej still preserve their original horizontal situation, the folding activity of this region seems to have ceased with the Pleistocene period, after having been at work during the whole Tertiary epoch.

According to Hennig, the continental epoch of Southern Tibet probably began in Postcenomanian and continued beyond Pliocene time. The atmospheric activity must during these long periods have been enormous in the Transhimalayan and Himalayan folds. Deep erosive gorges were cut down, old parts of the sedimentary and deep niveaux of the eruptive formations were exposed and laid bare by the continuous denudation. It is clearly proved by the distribution of the specimens of rock which I collected, that the uncovering of the lower, *i. e.* the older parts of the eruptive and sedimentary formations in the latitudinal valleys between the Transhimalaya and Himalaya, has been caused by a very strong and energetic fluvial erosion. In the



The orography of Tibet, according to Oswald, 1909.

enormous block of mountain folds which originally constituted the Himalaya (incl. Transhimalaya), the mighty valleys of the Gartok-Indus, the Satlej and the Tsangpo along the latitudinal axis of the system were chiefly formed by erosion of running water. Only by these valleys was the Transhimalaya separated from the Himalaya. Hennig, however, does not deny the possibility that these valleys were originally and partly traced as fold-troughs or were due to other orogenetic causes, and that the rivers then had only to continue to cut out the depressions. However, from geological facts Dr. Hennig regards the valleys separating Transhimalaya from Himalaya as erosive valleys and not as tectonic or merely orogenetic valleys.¹

In Hennig's opinion the comparatively even lake depression north of Transhimalaya, as a rule consists of the same sedimentary and eruptive formations as Transhimalaya itself. It is consequently not to be regarded as a depression formed by denudation as in the case of the depression south of Transhimalaya. He thinks that the depression including Tengri-nor, Dangra-yum-tso, Nganglaring-tso, etc., is a folding-trough of the same nature as those separating other mountain systems of Tibet to the north of the Transhimalaya.

Hennig has thus proved that also the post-eruptive Oligocene and Pliocene sandstone formations have taken part in the folding procedure of the Transhimalaya; consequently the folding activity of the mountain system continued to the end of the Tertiary epoch. Therefore the folds of the Transhimalaya are as young as those of the Tibetan plateau-land, a fact that is not at all interfered with by the different stretching of the Transhimalayan ranges.

The same process has been explained by H. H. HAYDEN in the following words²: »Until a comparatively recent date in the geological time-scale — the middle Tertiary epoch — all the northern part of what is now the Himalaya, and probably the whole of Tibet were covered by a great sea, in which deposition of sediment had continued for a vast period. At length, owing to forces the origin of which we can at present only conjecture, a period of crust-movement set in and the floor of the Tibetan sea began gradually to rise and to be thrown into a series of long parallel wave-like folds.

»As the crests of the earth-waves rose from the waters of the sea, they were eroded by rain and weather, and the rising land became broken and irregular: drainage basins were carved out of its flanks and a river system, composed of 'transverse' valleys, was gradually developed. As elevation continued, the troughs of the folds emerged and a series of 'longitudinal' valleys was established at right angles to the transverse valleys and parallel to the longitudinal axes of the folds. From a combination

¹ He therefore cannot agree with the views set forth by Dr. FELIX OSWALD in his *Transhimalaya and Tibet*, Science Progress, No. 17, July 1910. The interesting map accompanying this article is here reproduced as Pl. LXXII.

² A Sketch etc. . . , p. 47.

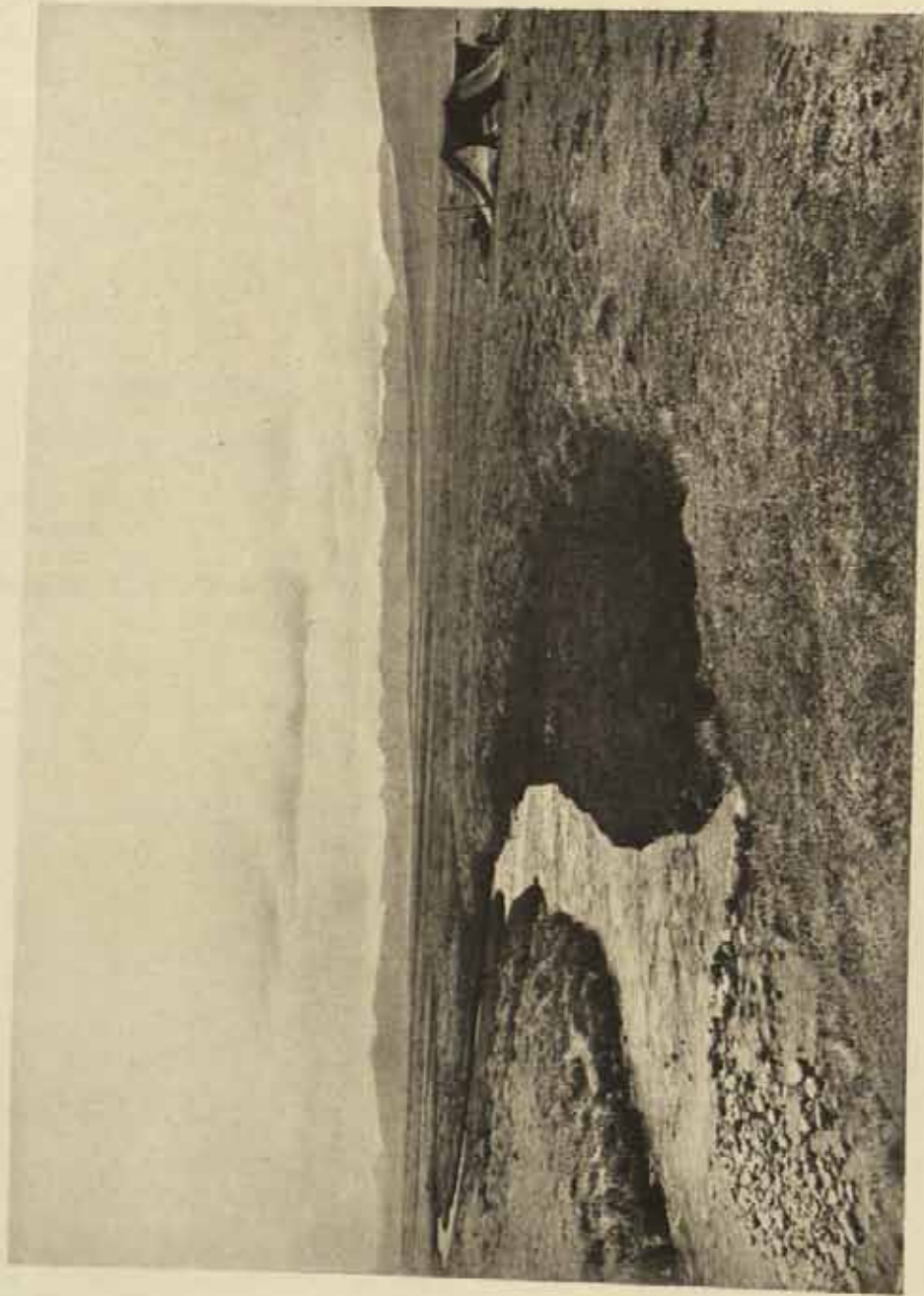
of the concurrent processes of elevation and erosion, the existing mountain systems of the Himalaya and Tibet have been slowly evolved.» He adds »that the great series of parallel plications in Asia are supposed to have been caused by a horizontal thrust from the north.» It is important to remember this view, for the arrangement of the Transhimalayan folds cannot be explained merely as a result of a horizontal thrust from north to south.

A few quotations from Dr. FELIX OSWALD'S above-mentioned article will be of interest in this connection. Regarding the mountain-folding and formation of lakes he says¹:

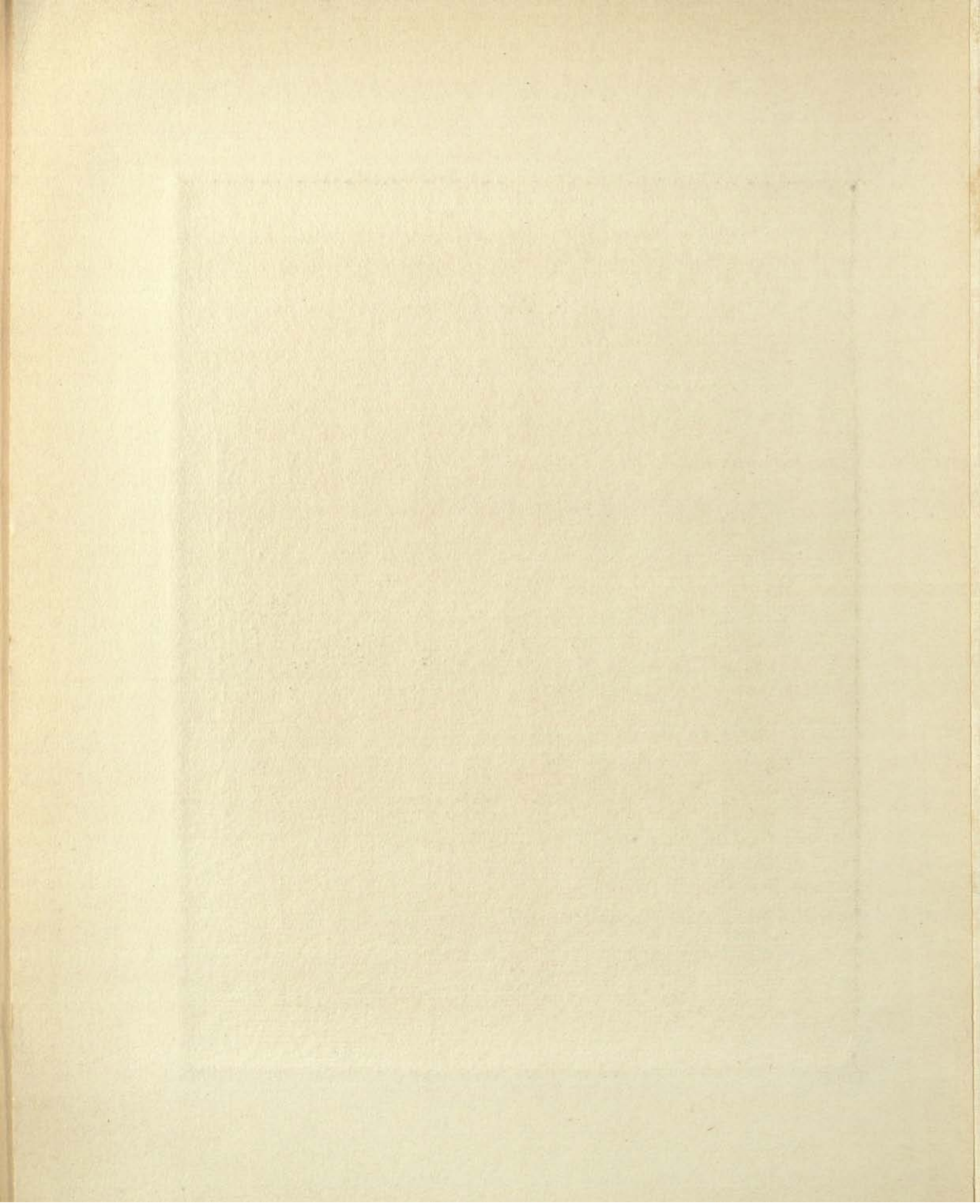
»Although the Tibetan plateau is traversed, in the first place, by latitudinal mountain folds, which are to be regarded essentially as the expanding branches or fan-like virgation of the Karakoram ranges, yet in all probability Tibet consists, in its present condition, of a succession of uptilted and depressed blocks of resistant strata, no longer capable of being folded, just as I have shown to be the case in the plateau of Armenia. The innumerable lakes still scattered over its surface, although many more have completely dried up, lend support to this view, for their origin is now explained by local uplift of the beds of the rivers which originally traversed the region. Hence, if the rate of elevation exceed that of the erosion of the river, the stream would be unable to keep its channel open and consequently a lake would be formed. In other words, local elevation has enhanced the erosive power of the river below and diminished it above the line of uplift! However, in some cases at any rate, a river has been able to keep pace with the local uplift in the plateau region.» Here he mentions my observation that the Bogtsang-tsangpo at some places sharply turns to cut through a rocky crest, whereas it would seem much easier to flow on along the open latitudinal valley. The same phenomenon was observed by Oswald in the valley of the Murad or Eastern Euphrates, and BURRARD describes the curious way in which the Indus thrice pierces the Ladak Range.

In opposition to Prof. Hennig he regards the Tsangpo valley as a sunken trench and not as a valley formed by river erosion: »As a corollary to the explanation which I offer of the Transhimalayan system, it follows that the natural continuation of the parallel ranges of the block lies now sunk beneath the Brahmaputra valley, at the base of the great fault-scarp, to which the river flows in parallel alignment. Accordingly this valley must be of the nature of a rift-valley or sunken trench, especially since the opposite (southern) wall of the valley lies parallel to the northern wall and in like manner possesses an average height of 23,000 feet The sacred lakes Manasarovar and Rakas-tal lie centrally in a glacial trough in this W. N. W.-E. S. E. rift-valley, which occupies the site of a relative depression between uptilted mountain blocks.»

¹ Op. cit., p. 43 *et seq.*



LOOKING N 28° W — N 24° E FROM CAMP 177, KONAK.



Further Oswald observes that the Transhimalayan arcs exhibit a sharper curvature than the arc of the Himalaya taken as a whole. »It will also be noticed that the orientation of the Transhimalaya arcs has more in common with that of the Great Himalaya on the south side of the Brahmaputran trough than with the latitudinal alignment of the ranges of Tibet; that the convexity of the arcs decreases from north to south, and that structurally Transhimalaya must be regarded as part of the Himalayan system.¹ Its mountain-folds must also have been formed at a date anterior to those of the Tibetan-plateau.» As quoted above, Hennig has proved that the formation must have been simultaneous.

Some 25 years before Prof. Hennig had adopted the view of the erosive formation of the great latitudinal valley separating the Transhimalaya from the Himalaya, the same opinion was clearly set forth in the *Manual of the Geology of India* by H. B. MEDLICOTT and W. T. BLANFORD, which in 1893 was again published by R. D. OLDHAM.² According to them the forms of the hills and their intervening valleys are due to the action of rain and rivers and to frost. The sources of the Himalayan rivers are situated north of the line of highest peaks, and this zone of special upheaval is crossed by the deep valleys of the river. »These valleys are due to subaerial erosion and are entirely produced by the action of rain and rivers.» In the very beginning of the upheaval of the Himalayas a pair of latitudinal valleys was established along the northern face of the system. The drainage from these valleys escaped round the extremities of the upheaval. All the water north of the present line of highest peaks escaped through this pair of latitudinal valleys. »As the mountains were upheaved the gradients of the rivers flowing directly to their southern margin became steeper than those of the longitudinal valleys north of the main range, the erosive power of the streams increased, and they were able to cut back through the line of maximum upheaval and rob part of the drainage which originally flowed east and west to the gorges of the Indus, Sutlej, and Sanpo.» The slopes of the valleys to the south of the passes thus became much steeper than those of the northern. The erosion of the southern valleys therefore became more rapid, and in course of time the water-parting gradually progressed northwards.

According to Oldham, differential earth movements show that the Himalayan system is still in a state of strain, and he naturally concludes that this strain is due to the compression which originally caused the elevation of the Himalayan folds. If it be true that this compression and upheaval is still going on, the gradual desiccation of the Tibetan lakes also becomes quite natural. »There are no data available regarding the rate at which this is taking place, but the fact that some have dried completely

¹ Hennig and Oswald agree that the geological structure of the system is a support to the name I have given it, Transhimalaya, which emphasizes its intimate connection with the Great Himalaya.

² Cf. p. 463 *et seq.*

up, while others show but little reduction in their original size, indicates that the process is still in progress and that the climate of Tibet was once moister than it now is. There appears to be but one explanation possible of this increased dryness of climate, and that is a rise of the mountains to the south, which has resulted in a more complete cutting off of the moisture from the monsoon winds.» Oldham also regards the drying up of Ladak as a direct result of the elevation of the Himalayas which gradually cut off a larger and larger proportion of the moisture coming with the southern winds.

This theory no doubt is correct, but the question is whether it may be regarded as sufficient to explain all the phenomena of desiccation in the interior of Asia. It seems to me that the rise of the southern mountains must be much slower than the desiccation of the lakes. The denudation is constantly in action to destroy the mountains, and PENCK is no doubt right in speaking of an upper limit of denudation above which no peak could ever rise. However, the desiccation of the Caspian Sea, and the growth of the desert of the Tarim Basin cannot be due to the rise of the Himalayas. The problem seems to be more complicated. There may be a climatic period of very high order and considerable length which may be due to cosmic causes, and a shorter, terrestrial, period to which the desiccation of the Tibetan plateau-lakes is due. On the other hand Oldham is no doubt right in saying that the strain is still going on in the Himalayas, and that the Tibetan lakes have been formed by earth movements in connection with this strain. On the shores both of the Caspian Sea and of Issik-kul there are excellent proofs that such earth movements have been active even during historical time.

In 1893 the authors of *A Manual of the Geology of India* did not regard the origin of the Tibetan lakes as thoroughly established. DREW ascribed their origin to the damming up of the main valleys by the fans of their tributaries. During the glacial period these tributaries were larger and the disintegration of the rocks more rapid than now.¹ Oldham could not accept the theory of Drew regarding the formation of the lakes. He found it more natural to suppose that the main stream would be able to keep its channel open. He believes that the lakes have been formed by differential movements of the surface. »Whatever may be the cause of origin of these lakes, there seems no reason to doubt that the broad shingle plains, which so frequently occur just above where the rivers enter a gorge, are produced by a check in the gradient consequent to a recent elevation of the river bed in the gorge, and consequent checking of the gradient immediately above it. A similar action might well, under favourable circumstances, give rise to the formation of an actual lake,

¹ R. D. OLDHAM, Some Notes on the Geology of the North-West Himalaya. Records of the Geological Survey of India, Vol. XXI, Calcutta 1888, p. 149 *et seq.* — and *A Manual of the Geology of India* 1893.

while the existence of an exit would depend on the rapidity of the movement, the supply of water, and the nature of the climate.» He feels persuaded that there have been irregular movements of the beds of the streams and rivers within a very recent period, and in the existence of these movements he finds an evidence that the disturbance which caused the elevation of the Himalayas is still in progress. However, he does not deny that lakes under certain circumstances may be directly formed by talus dams. If a portion of a river valley were elevated more rapidly than the rate of erosion of the river, »the barrier so raised would react up stream and cause the formation of a sloping surface of river gravels. If then for some distance the configuration of the river valley was such that but little débris was shed into it, and below this region the amount of débris suddenly increased, it is quite conceivable that the rock barrier lower down might prevent this being carried away as fast as it was shed, and so a talus dam formed across the valley.» Only the various degrees of desiccation of the different lakes is difficult to reconcile with the talus theory. Some lakes have entirely disappeared while others, as the Ling-shi-tang Lake, have dwindled to one-tenth of their original size. Again, others, as the Panggong-tso, have half of their original area, and Tso Morari has contracted only to four-fifths of its former extent. Oldham therefore concludes that these great variations in the degree of desiccation would hardly be possible if the lakes had been formed at one period. If we, on the other hand, accept his theory of the differential earth movements, the varying degrees of desiccation in different lakes would be quite natural.

Returning now to the great well-defined valley occupied by the chain of lakes to which the Selling-tso in the east and the Panggong-tso in the west belong, we will, in a few words, consider the different opinions regarding the formation of the last mentioned lake.

According to Drew the Panggong-tso was formed by the damming up of the main valley by the talus-fan of a southern tributary at the place where the low threshold is situated between the lake and the Shayok drainage area.

Oldham, on the other hand, says that the formation of the lake is entirely due to differential movements of the surface, »which raised a portion of the original river bed at a more rapid rate than the stream was able to erode, and dammed back the drainage to produce the present lake», in the same way as he imagines the formation of Tso-moriri in Rupshu.

ELLSWORTH HUNTINGTON who visited the Panggong-tso, May 1 to 6, 1905, as a member of the Barrett Expedition to Central Asia, expresses the opinion that the lake basin, with a length of 105 miles and an average width of only 1.8 miles where covered with water, is due to glacial erosion.¹

¹ Panggong: A Glacial Lake in the Tibetan Plateau. *Journal of Geology*, Vol. XIV, Chicago 1906, p. 599 *et seq.*

From old moraines he concludes that the basin was once or twice filled with ice, while later lacustrine deposits are due to less severe changes of climate in more recent times. Although the old outlet is evident as well as the supposed dam which he found to be a large fan of 1500 feet in radius, having its lowest point 90 feet above the lake, Huntington cannot accept the view of Drew. According to Huntington, this water-parting fan does not appear to have been the cause of the formation of the lake; on the contrary, it rather appears to have been able to grow up because the former stream from the Panggong region ceased to flow. He points to the fact that the permanent stream just above Muglib has had no difficulty in keeping open the broad channel through fans as large as that at the divide. One of the smallest tributaries would not be able to dam the main stream. Neither are there any traces of a moraine that has dammed the valley. The dam theory is therefore untenable. The only alternative Huntington is able to find is that the Panggong-tso basin is closed by a rock-lip, behind which the basin may have been glacially eroded. There seemed to be nothing against this theory, for Huntington found abundant signs of glacial action, a fact that of late years has been often corroborated, especially in the Kara-korum. The authors of *A Manual of the Geology of India* also speak of the evidence of a former great extension of the Himalayan glaciers.¹ They mention glaciers which formerly were 15 miles in length, and now have dwindled to only one mile. Some glaciers once reached to below 2000 feet above the sea. Regarding the extension of the presumed Panggong glacier Huntington says: »The glacier did not come to an end at the rock-lip, as might be expected, but continued on for 20 or 30 miles as a comparatively narrow tongue giving rise to the U-shape of the outlet valley If the Pangong basin is due to glacial erosion, it is necessary to explain why in what once was a single uniform valley the part above the lip has been widened ten times as much as the part below, and deepened correspondingly.»

When travelling along the Tso-nyak, Tso-ngombo and Panggong-tso, December 1901, I also got the impression that the basin of this long series of lakes was excavated by glacier action. But as the most extended and compact region of glaciation was situated in the gigantic mountains to the north-west of the Panggong depression, where the greatest portion of the precipitation was caught, and formed enormous ice-fields, I thought that the old Panggong glacier, perhaps fed from several ice-fields, was directed from the moist parts of the mountains in the north-west to the dry plateau regions in the east. I wrote: »The impression rose in my mind, that the elongated depression in which the lakes lie, and which orographically really is a latitudinal valley, once served as the pathway for a big and massive glacier, which

¹ Op. cit., p. 484.

had its gathering-grounds and firn-basin to the west, and itself travelled east through the valley; and it is in consequence of this that the bottom is so smooth and level as we actually find it to be There, however, we are confronted with the difficulty of explaining the possibility of movement on the part of the ice-stream along what was practically level ground, or even somewhat rising ground.»¹

However, having studied the problem of the Tibetan lakes more thoroughly and compared the different theories concerning them, I now feel inclined to abandon the theory of their glacial origin completely. For even if this theory seems to suit the formation of the Panggong-tso very well, it is not sufficient to explain the formation of the hundreds of lakes spread over the Tibetan plateau-land. Further I do not think that Drew's theory of talus fans in the mouths of tributaries damming up main valleys can simply be dismissed, for in some cases such fans may have played a considerable part. The Panggong valley, not only the part of it that now is covered with water, but also its eastern continuation from Tso-nyak, has all the characteristics of a fluvatile formation and the features of having been eroded by a considerable river. My soundings in the Panggong lakes, undertaken from the ice in the freshwater lakes, and from a boat in the western, salt-water lake, proved that the depth, as a rule, increases from east to west until it reaches its maximum with 47.50 m. in the western part of the Panggong-tso. Until a detailed measurement of the height of the threshold between the Indus system and the lake has been carried out, the real height of the threshold above the Panggong-tso remains uncertain. Strachey says the water-divide lies 100 feet above the lake, Huntington gives 90 feet, though I do not know by what means these figures have been arrived at. On December 22nd, 1901, I got an altitude of 4327 m., and on August 22nd, 1906, one of 4331 m., both by boiling-point thermometer and three aneroids. The altitude of the lake being 4317 m. according to my observations, the height of the threshold would be only 12 m. above the lake. As the maximum depth of the western part of the lake is 47.50 m., a talus fan of a thickness of 60 m. where it is lowest would be sufficient to dam up the valley and make the formation of a lake both natural and necessary. The progress of this process has obviously been gradual and periodical. As a rule the erosive power of the out-flowing river has been active at the same rate as the increase of the talus fan. During comparatively dry periods the erosive power has diminished, but the increase of the talus fan has continued, though at a much slower rate. At periods the lake has been cut off completely. During the next moist period the lake has again risen to the lowest part of the talus threshold then existing. Such periods of rise and fall of the surface of a lake on account of alternating moist and dry periods may still be observed in the Manasarovar

¹ Scientific Results, Vol. IV, p. 344.

and its channel to the Rakas-tal, though the latter is not dammed by any talus fans from tributaries.

Comparing different lakes in Tibet with one another, I have arrived at the conviction that the problem of the formation of the lakes is much more complicated than it would seem to be if we accepted as a general rule only one of the three theories mentioned above. It cannot be said that Drew alone is right and Oldham and Huntington wrong, nor that Oldham or Huntington were right to the exclusion of the two others. As far as Panggong-tso is concerned, I think that all three theories may be applied at different periods of the history of the lake and its valley. Very likely the Panggong valley may have been filled with glacier ice during the glacial period. But during ages before the glacial period, even from the period when the Himalayan and Transhimalayan fold systems began to be formed, and until the present day, differential movements of the surface have been going on. The ice has disappeared and the climate has become drier. But even during the post-glacial time, the precipitation has been incomparably more abundant than nowadays, and great rivers have been flowing through the long latitudinal valleys of the Tibetan high-lands, valleys which still exist, although the rivers have dwindled and disappeared because of the periodically proceeding desiccation. Finally the continual differential movements of the surface have gradually divided every latitudinal valley into a series of separated self-contained basins, usually with a salt lake in the centre.

At a period when the latitudinal valleys were divided in this way, the talus fans of Drew may easily have played a certain part in the formation of some of the peripheric lakes of Tibet. And thus all the three theories may be said to be correct. The differential movements belong to the whole history of the building up of the southern mountains, the glacier erosion to the ice age and the talus fans to the post-glacial epoch with a growing dryness of the atmosphere.

BURRARD and HAYDEN may be said to have added a fourth theory to the three of Drew, Oldham and Huntington. They say¹: »The further suggestion, now made by us, that the damming of the main valley may have taken place owing to its conversion into a tributary valley, may be regarded as a modification of Mr. Drew's hypothesis, and if we add to this the damming of tributary valleys by moraines of glaciers occupying the main valley we shall probably have included all the causes at work to form the more important lakes of Tibet. But we are not disposed to think that any single theory can be of universal application: thus Kala Tso may be regarded as a type of the first hypothesis (with its corollaries), Yamdrok Tso of the second and, according to Mr. Huntington, Panggong is a type of the third.»

¹ Sketch . . . p. 203.

CHAPTER LVII.

THE FORMATION OF PANGGONG-TSO.

Before proceeding to the description of the Selling-tso—Panggong-tso latitudinal valley, I will say a few words of the latest phase of the history of the first-mentioned lake.

There are two pairs of lakes which offer an extremely clear idea of the course of development through which the Panggong-lakes have passed, *viz.*, the two lakes near the source of the Yellow River in the extreme N. E. of Tibet, and the Manasarovar-Rakas-tal in the extreme S. W. of the same highlands. As to the first-mentioned, I borrow the following description from P. K. KOSLOFF who visited them on his journey in Eastern Tibet from May 1900 to June 1901:

The Mongols call the western lake Jarin-nor, and the eastern Orin-nor; the Tsaidam Mongols also use the names Tseke-nor (the Lake whose bottom shines through) and Tsege nor, (The Transparent lake); the Tibetans and Tanguts call them Mtso Khchara and Mtso Khnora, and Prshevalskiy, who first gave a description of them, baptized them with the superfluous names The Expedition Lake and the Russian Lake. »These two freshwater basins are separated from one another only by a mountainous neck of land with a breadth of up to 10 versts¹, and are situated at an absolute altitude of 13,900 feet (4238 m).» The Orin-nor has a circumference of about 120 versts, and its long axis stretches from north to south, whereas the Jarin-nor, which stretches from west to east, has a circumference of less than 100 versts. Both lakes are surrounded by high, rocky, steep shores with many narrow capes and promontories. Along the shores there are several small lakes or pools, which formerly were parts of the large lakes but now have been cut off by sand banks. They contain brackish or salt water. The upper lake, Jarin-nor, seems to be shallow, as the bottom, especially in its western part, is visible and there are several islands. The lower lake, Orin-nor, is comparatively deep. Along the long axis of this lake

¹ On his map the isthmus is 12 versts broad at its narrowest place, and at its broadest more than 20.

the depth was measured by V. F. LADYGIN from north to south some 10 versts from the point where the Yellow River goes out of the lake, and here the greatest depth was found to be 15 sashen (32 m.), at the last point measured.

On June 23rd the temperature at the bottom was $7,8^{\circ}$ to $8,2^{\circ}$, and at the surface $8,7^{\circ}$ to $12,1^{\circ}$. The water is transparent and of a greenish blue colour. There are diatoms and algæ in abundance.

»The two lakes are joined with one another by a river arm flowing from the S. E. corner of the upper to the S. W. corner of the lower lake. It has a length of 15 versts and a breadth of from 15 to 50 sashen; in the latter case the river is divided into a net of branches; at places where the river flows in one bed its breadth is never more than 30 sashen. During our visit the river had a yellowish colour and flowed with considerable velocity between its low swampy banks; the muddy colour of the water was also visible in the part of the lower lake situated near the entrance of the river, where mudbanks were formed and where the lake therefore was shallow and algæ growing.»

The surroundings of the lakes are hilly. At the northern shore of Jarin-nor, two broad flat valleys come down, opening the view to the north where in the distance the mountain ranges of Munku-tsasato-ula and Khatiyn-khara are visible. From Orin-nor the view is free to the north and S. W.

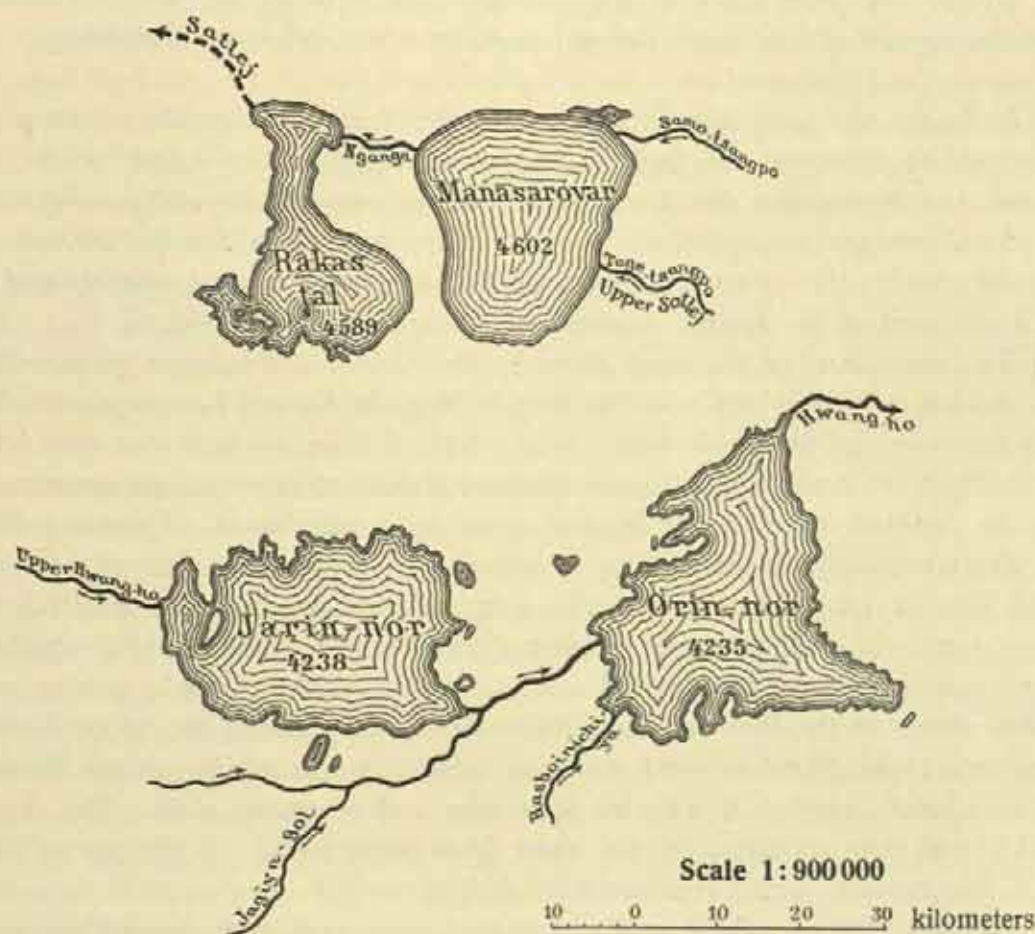
Jagiyn-gol comes from the south and joins the channel between the lakes, or rather enters the swamps along its southern side. The Rasboinichiya (»The Robbers' River») is a rivulet entering the Orin-nor at its S. W. corner. A northern tributary of older maps does not exist in reality.

From the swampy region Odon-tala or Star-sea west of Jarin-nor, the little river Saloma enters the lake. This river KOSLOFF regards as the »Uppermost Hwang-ho» or the source branch of the Yellow River. From the northern corner of the Orin-nor the same river again goes out, under the name of Ma-chu.¹

Comparing this short description of Kosloff with the description of Manasarovar and Rakas-tal as given in Vol. II of this work, the reader will agree with me that the resemblance is remarkable. The two famous lakes of S. W. Tibet correspond in nearly every detail with the two lakes of N. E. Tibet. There are in both cases two freshwater lakes separated from one another by a comparatively narrow meridional neck of land. The upper lake is in both cases nearly round and only a few meters higher than the lower one. The two upper lakes, Manasarovar and Jarin-nor, receive affluents coming from the interior side of the plateau-land, and from each of them a channel crosses the separating neck of land carrying the water from the upper

¹ П. К. Козловъ: *Монголия и Камъ Труды Экспедиции*. Имп. Русск. Геогр. Общ. соверш., въ 1899—1901 гг. Томъ I, Часть вторая. С.-Петербургъ, 1906.

to the lower lake. The isthmus is in both cases filled with rocky ridges except in the part of it where the channel flows. In the case of Manasarovar the channel is situated in the northern part of the isthmus, while in the Jarin-nor case the channel is placed in the southern part. Two more considerable affluents enter the Manasarovar: the Samo-tsangpo and the Tage-tsangpo. The same is the case with Jarin-nor where the Saloma or Upper Hwang-ho enters the lake itself, while the Jagiyn-gol



by a little mountain ridge is prevented from entering the lake itself; it therefore joins the channel a very short distance from the point where the latter leaves the lake.

The resemblance between the two lower lakes, Rakas-tal and Orin-nor, is not less striking. Their forms are more irregular, their shores richer in bays, capes and rocky promontories, especially along the southern shores, which is quite natural as they are situated nearer the margin of the highlands, more surrounded by mountains and farther away from the flatter plateau-land. In both cases the northern part is narrow, the southern broad, and in both cases the effluents—the Satlej (though

now dry), and the Hwang-ho — leave the lakes in the exterior corner of the northern narrow parts of the lakes.

The Jarin-nor thus plays exactly the same part as the Manasarovar, the Saloma as the Samo-tsangpo¹, the Jagiyn-gol as the Tage-tsangpo, the channel from the Jarin-nor as the channel of Ngangga, the Orin-nor as the Rakas-tal and the Hwang-ho as the Satlej.

But in one point there is a great difference between the two pairs of lakes: the Manasarovar-Rakas-tal have suffered more from the influence of desiccation than the Jarin-nor and Orin-nor!

In length the Jagiyn-gol is superior to the Saloma, rather than inferior. As to the volume of water, the Jagiyn-gol is much bigger. The length of the latter is about 150 versts, and the fall of the valley is comparatively steep. Where the river flows between mountains the current of the water is wild and the passage is impossible; where the valley is broad and open the depth is as a rule 3 or 4 feet. During the visit of the Russian expedition it rained day and night.

The description of the lakes given by PRSHEVALSKIY some 16 years before is more valuable. He explains how the Yellow River is formed by sources and small watercourses in the Odon-tala basin, after which it flows through two rather large lakes. These are both situated at an absolute altitude of 4270 m., and are separated from one another by a rocky isthmus some 10 versts broad. They are of the same size and have a circumference of about 130 versts each. As to form, they remind one of irregular ellipses. The long axis of the Jarin-nor stretches from west to east, while the Orin-nor is oblong from north to south. »The shores are nearly everywhere mountainous and very indented, which especially is true of the southern shore of the Orin-nor where also three small islands are to be found; at the western shore of the Jarin-nor there are two. The mountains around the shores have an altitude of 120 to 180 m. above the surface of the lakes. The depth is probably not very considerable; the water is perfectly fresh. In the second half of July its temperature varied from 10,5 to 17,8°.»

»At the northern shore of the Jarin-nor some small watercourses are said to fall out, while at its western shore the Saloma or Upper Hwang-ho enters the lake which it again leaves at its eastern bay-like side, after which it pierces the separating rocky isthmus and falls in the northern (!) part of Orin-nor. This lake also receives from the S. W. the river Jagiyn-gol and from the south another hitherto nameless river (Rasboinichiya). During the summer these rivers give to the water along the shores a dirty yellowish colour. In the rest of the lakes the water is clear and

¹ It should be noticed that Kosloff regards the Saloma as the source branch of the Yellow River just as I regard the Tage-tsangpo as the source branch of the Satlej. In both cases the source branches pass through the upper lakes and continue through the channels to the lower.

has a dark green colour. As so many other lakes in the interior of Asia, the Jarinnor and Orinnor diminish in size or, in other words, dry up.» Prshevalskiy finds several proofs of this theory; as: »The gradually drying pools in depressions along the shores which formerly have been bays and inlets, the extended swamps along Saloma, at the sides of the lower course of the Jagiyn-gol and along the river entering near its mouth, finally both recent and old beach-lines, the latter being here and there visible at some distance from the present shore line.»

Prshevalskiy also talks of much rain in the middle and end of July. The Jagiyn-gol had then at the fords a breadth of 50 to 65 m. and a depth of one meter. At the same season Prshevalskiy was told that the Hwang-ho after having left the Orinnor could not be forded, so he had to desist from a planned visit at that important place. Kosloff crossed the river just where it leaves the lake.¹

While the Satlej has been cut off from the Rakas-tal since 150, or 200 years, the Yellow River still uninterruptedly flows out of Orinnor. The Ngangga channel is only periodically in function, whereas the channel between Jarinnor and Orinnor always has flowing water. The source lakes of the great Chinese river give us an excellent idea of the state of things which prevailed at the source lakes of the great Indian river only a few hundred years ago. At that time the Ngangga continually carried water, and the Satlej uninterruptedly streamed out from the Rakas-tal. On the other hand, the Manasarovar and Rakas-tal show us the fate awaiting the Jarinnor and Orinnor if the dryness of the climate will continue for a sufficient length of time. For then the superfluous water of the Orinnor will not be sufficient to feed the Hwang-ho, the river will dwindle, and finally no water will flow out through its bed. Later on the surface of the Orinnor will continue to sink until the difference in absolute altitude between it and the surface of the Jarinnor which is now only 3 meters, will approach the present difference in the altitude of Manasarovar and Rakas-tal, which is 13 meters. But even at that period the channel will periodically, that is to say, during moist years, carry some water. Simultaneously the two lakes which now are somewhat larger than the Manasarovar and Rakas-tal, will lose in area, especially the Orinnor.

The two pairs of lakes are surrounded by regularly folded mountain ranges and ramifications from them, the main ranges running from N. W. to S. E. or from W. N. W. to E. S. E. Between these ranges stretch latitudinal valleys with rivers. Immediately along the exterior shore of the exterior lake, or west of Rakas-tal and east of Orinnor, ramifications from the main ranges are running, and in both cases the outgoing rivers, the Satlej and the Hwang-ho, have found an escape to the latitudinal valleys they follow through the peripheric regions.

¹ *Отъ Кяхты на истоки Желтой Рѣки . . .* Н. М. Пржевальскаго, С.-Петербургъ 1888, p. 194 et seq.

The altitudes of the mountains north and south of the two Satlej lakes considerably exceed the altitudes of the mountains surrounding the two lakes of the Koko-nor province. On Kosloff's beautiful map, *Восточный Тибетъ (Камъ) по съемкѣ П. К. Козлова, Май 1900 — Июнь 1901*, only the altitudes of passes are entered, whereas no altitudes of peaks are given. The blue colour of some ten peaks proves, however, that they are covered with eternal snow, while the most important range of ice and snow, Amne-machin, is situated at about 100 versts east of Orin-nor.

Kosloff has two parallel ranges north of the lakes, the Burkhan-Buddha with the pass Nomokhun-daban, 16,030 feet or 4887 m. high, the Amnen-nor Range which is a N. W. continuation of the Amne-machin with the secondary pass Jeroia, 15,999 feet or 4875 m. high, and a nameless water-parting pass of 15,780 feet or 4811 m.

To the south of the lakes there is a series of ranges baptized by Kosloff with names which never will be accepted by geographers, such as, from north to south, »The Water-parting Range», »The Range of the Pundit A—K—», »Dutreuil de Rhins' Mountains», »The Range of the Imperial Russian Geographical Society», »Woodville Rockhill's Range» and »The Range of Dalai Lama».

The first of these, »The Water-parting Range», a name that has at least some *raison d'être*, though all ranges are water-parting, sends several ramifications to the southern shores of the lakes. The water-parting crest of this range was crossed by Kosloff in the pass Chshabu-vrun, 15,170 feet or 4625 m. high, and, farther east, in the pass Chatsan-la, 15,070 feet or 4591 m. high.

As we have no other means of comparing the altitudes of the mountains bounding the two pairs of lakes than the heights of the passes, we have to consider them here. The average altitudes of the passes north of the Hwang-ho lakes is about 4860 m., and the altitudes of those to the south about 4600 m.

Taking, on the other hand, the Transhimalayan passes whose altitudes I have measured north of the Satlej lakes, we have: the Surnge-la 5276 m. high, the Tsetilachen-la with 5466 m., the Tseti-la with 5628 m., the Lamo-latse-la with 5426 m. and the Jukti-la with 5814 m. The average altitude of these is 5522 m., or no less than some 660 m. more than the average altitude of the passes north of the Hwang-ho lakes.

The relation between the altitudes of the passes in the two cases indicates that the mountains north of the Satlej lakes are more massive and mighty than those north of the Hwang-ho lakes. As far as the southern mountains are concerned the difference is still greater. The average altitude of the Himalayan passes south of the Sacred Lake is about the same as that of the Transhimalayan passes north of it, or 5500 m., or no less than 900 m. more than in the case of the passes south of the Hwang-ho lakes.

Remembering the Kailas and other ice and snow-covered mountains north of the Satlej lakes, and the Gurla-mandata, Ganglung-gangri and Kubi-gangri south of them, we find that these lakes are situated between incomparably higher and mightier mountain ranges than the Hwang-ho lakes. In spite of this fact the Satlej lakes have reached a more advanced stage of maturity in the cycle of their development than the Jarin-nor and Orin-nor. Neither the absolute altitude of the lakes which in the case of the Manasarovar and Rakas-tal is 350 m. higher than in the case of the Hwang-ho lakes, nor the absolute height, compactness and snow and ice covering of the surrounding mountains therefore seems to be the most important factor in the preservation of the hydrographical functions of the lakes in question. It would seem that those lakes which are situated at the foot of the mightiest and most snow- and ice-covered mountains, would be more abundantly fed by affluents, but as a matter of fact the lakes at the foot of the lower mountains obviously receive more affluents and therefore preserve their hydrographic functions in full activity.

There must exist some other factor that brings about this state of things. The outlines and the forms of the two pairs of lakes make it very unlikely that their depressions could ever have been excavated by glaciers. Nor are there any moraines or talus fans from tributary valleys which have dammed them up. Their creation must therefore needs be due to the secular and differential movements in the earth's crust which are so intimately connected with the rise of the mountains. As the latter proceed, small thresholds and ramifications in the latitudinal valleys may easily take part in the general elevation of the main ranges, and in this way relatively low depressions may be left alone behind the uplifted parts of the valleys. In the course of time the cavities may increase in size, and, provided the precipitation is sufficient, they will not only become filled with water, but the superfluous water will also seek an outlet across the uplifted threshold and cut its bed deeper and deeper by its erosive power.

Provided that the cycle of development in the instances of the two pairs of lakes has been of the sort set forth above, the only conclusion we can draw is that the difference in their present state must be due to the distribution of precipitation. And here the part played by the absolute altitudes and the massiveness of the surrounding mountains comes in. In spite of the fact that the Hwang-ho lakes are situated four and a half times as far from the lowlands of the Ganges and Brahmaputra as the Satlej lakes, the latter receive less water from the surrounding mountains. The gigantic mountain ranges rising to the south of the Satlej lakes catch the greatest part of the moisture of the south-west monsoon which, in the form of rivers, returns to the south—to the Ganges, while the cavities of the lakes remain comparatively dry on the lee-side. The basins of the Hwang-ho lakes, on the other hand, being surrounded by comparatively lower ranges, are more exposed to the moisture of the winds, whether from the south-west or from the Pacific.

For an absolute, reliable comparison it would be necessary to know some other factors regarding the Hwang-ho lakes which now are unknown. It would be very important to know the drainage areas of the Saloma and the Jagiyn-gol as well as the volume of water they carry. Both the drainage area and the volume of water seem to be greater in the case of the Jarin-nor than in that of the Manasarovar. On the other hand, the Jagiyn-gol loses less water by evaporation as it joins the channel directly, than it would have done if its water first had been spread over the surface of the Jarin-nor. It is quite natural that the channel between the lakes should possess a greater vitality than the outflowing river, as is proved by the Ngangga, as compared with the Satlej. Therefore, if the desiccation continues, the Orin-nor will cease to deliver any water to the Hwang-ho centuries before the channel from Jarin-nor has become dry.

At any rate the two pairs of lakes offer a very beautiful example of geographical homology.

The Panggong Lakes present a combination very different from the two pairs of lakes we have considered hitherto. The Panggong-tso itself is salt, whereas the Tso-ngombo, and the small lakes which are parts of it are fresh; — the problem will be easier if we regard this chain of freshwater lakes as only one lake.

Still, there is a certain resemblance between these lakes and those at the sources of the Hwang-ho and the Satlej. There are two lake basins separated from one another by a neck of land, and joined one with the other by a channel through which the water flows from the upper to the lower basin. This channel, which is in function the whole year round, just as the channel between the Jarin-nor and Orin-nor, corresponds to the Ngangga which, however, is only periodical. The upper lake which corresponds to the Manasarovar and Jarin-nor, receives in its upper part, called Tso-nyak or Niag-tso, some affluents, one of them called Tsanger-shar. The superfluous water of the Tso-ngombo flows to the Panggong-tso which corresponds to the Rakas-tal and Orin-nor and which perhaps a thousand years ago or more was cut off from the Drugub river, a tributary to the Shayok. Therefore the river by which the Panggong-tso once delivered its superfluous water to the ocean was not the Indus itself, but only a tributary of the second class.

At present the Panggong Lakes are thus, as the Satlej Lakes, cut off from the Indus system. But the isolation of the Panggong Lakes is much older, as is proved by the salinity of its water, whereas the water of Rakas-tal is perfectly fresh. The different stages of maturity reached by the three pairs of lakes are due to the extent of the drainage areas and the quantity of precipitation falling on them. The drainage area of Panggong-tso is small, and the greatest part of the rain and water from melting snows goes directly to the Indus and the Shayok, while the lake remains in the «wind-shadow» of the S. W. monsoon. The affluents of the Tso-ngombo flow

through the Tibetan plateau-land where the precipitation is very poor. But it is sufficient for keeping the channel in function the whole year round. December 8th, 1901, at Camp CXLIV, I found its breadth to be 11,2 m., its mean depth 0,475 m., its mean velocity 0,591 m. and its volume of water 3,14 cub. m. per second. Fresh marks on the banks told me that the river, probably during the previous summer, had been 44 cm. higher and had carried about three times as much water as in December.¹ Probably most of this water comes from springs, flowing the whole year round. The area of the Tso-ngombo including all the freshwater basins, is about 250 square km., which is not half as much as the 558 square km. of the Manasarovar.² Disregarding the volume of all the affluents of the two lakes, which is unknown in the case of Tso-ngombo, it is obvious that the Manasarovar, in spite of the 29 cub. m. of water it received every second in July and August 1907³, suffered so great losses by evaporation that it could not send a drop of water to the Rakas-tal. Only in 1909, 1910 and 1911, when heavy rains fell, its channel during the summer months again entered in activity.

The Tso-ngombo loses less than half as much water by evaporation, and therefore its channel to the Panggong-tso is always in activity. In fact, the chain of lakes is more like an enlarged river-bed where the current in summer must be perceivable at every narrow place. In Jarin-nor the evaporation will be about the same as in Manasarovar; but as the Saloma probably carries more water than all the Manasarovar affluents together, the upper Hwang-ho lake can probably always send an effluent to the Orin-nor. The latter lake, on the other hand, has a more favourable situation in that its other affluent, the Jagiyn-gol, avoids the Jarin-nor and therefore loses not a drop of its water by lake evaporation.

Comparing the most recent stages of development in the history of the three pairs of lakes we may sum up their relations in the following points:

1. The Jarin-nor and Orin-nor are still in full activity the whole year round, belong to the Hwang-ho and drain to the ocean.
2. The Manasarovar periodically and only during the summer drains to the Rakas-tal, whereas the Rakas-tal for 150 or 200 years has been cut off from the Satlej and the ocean. But as the latter lake is still fresh, the two lakes must be regarded as still belonging to the Satlej and the Indus system.

¹ Scientific Results, Vol. IV, p. 304. *Vide* at the same place two photographic views of the channel.

² Professor W. HALBFASS of Jena has, from my data, calculated that Manasarovar has an area of 558 sq. km., a volume of 30,7 cb. km., a mean depth of 49,5 m., a circumference of 96 km. and that it in volume stands between Lago Maggiore, 37 cb. km., and Lago di Como, 27 cb. km., and in area between Lac de Genève, 582 sq. km. and Bodensee, 538 sq. km.

³ Cf. Vol. II, p. 187.

3. The Tso-ngombo has an effluent to the Panggong-tso the whole year round, but the Panggong-tso was so long ago cut off from a connection with the Drugub-Shayok, that it has become salt. It must therefore be regarded as no longer belonging to the Indus system and oceanic drainage, but essentially to the Tibetan plateau-land.

We now have to consider the most important differences in the three pairs of lakes, *viz.*, their form and their beach-lines. The Satlej and Hwang-ho lakes are of the same kind; they are rounded or elliptic, and have only badly developed, quite recent beach-lines at 2 or 3 m. above the present water level. Their hydrographic fluctuations make the formation of beach-lines nearly impossible. If the Saloma and Jagiyn-gol suddenly should carry ten times as much water as now, the only result would be that the Hwang-ho at the exit from Orin-nor would increase in volume, without giving the lake an opportunity to rise more than one or two feet. But if the two rivers should decrease so much that the outflow from the Jarin-nor channel ceased for several years, then, of course, the Orin-nor would be cut off from the Hwang-ho, and its surface would sink gradually. Under such circumstances the actual outlines of the lake would be clearly visible in the form of a beach-line. For the erosion of the Hwang-ho is so slow that the surface of the Orin-nor may be regarded as stationary. The action of the waves and of the ice, especially where it breaks up during hard storms in spring, is much stronger and quicker than the action of the erosion in a river bed.

In August 1907 the highest point in the channel Ngangga was at 2,263 m. above the surface of the Manasarovar. This much the lake had to rise before delivering any water to the Rakas-tal. The affluents had to bring down to the Sacred Lake 1,267 millions cub. m. of water to bring about a rise of 2,263 m. As the 2,475,360 cub. m. in 24 hours which I measured in all the affluents only were spent for compensating the loss by way of evaporation, the 1,267 millions mean a very considerable increase in all the affluents. At a level of 2,263 m. above the lake a beach-line could be seen at several points around the lake, but above that height no other marks of the action of waves and ice could be noticed. Therefore, as the water above a certain threshold in the bed of an effluent always escapes, it is quite natural that in the case of such lakes as those of the Satlej and the Hwang-ho no beach-lines at a considerable altitude may have been formed. On the other hand the possibility always remains that the erosion of the outflowing river may have been strong enough to cut down its bed to a considerable depth. The surface of the lake then sinks at the same rate so slowly and gradually that beach-lines at certain heights scarcely can be formed. The result of the gradual action will rather be an abrasion slope.

Turning now our attention to the Panggong-tso and Tso-ngombo, we find that their form is of a quite different type from that of the two other pairs of lakes.

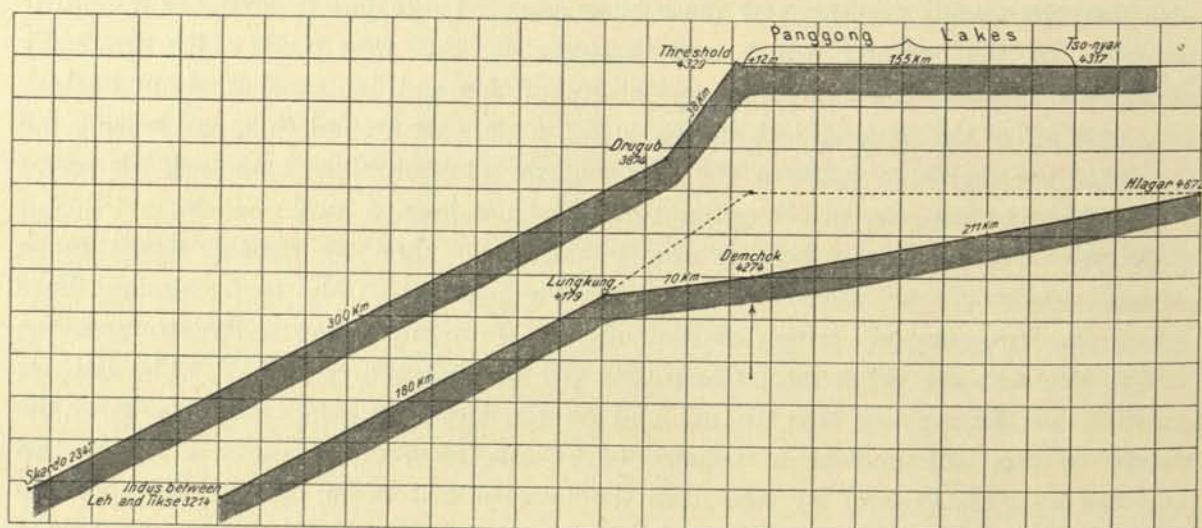
The Panggong Lakes have a length of no less than 155 km., while the breadth is at many places only 1,2 km., at the most 5,6 km., and as an average 2,4 km. They are much more like a gigantic river than a series of lakes. Day after day you travel along their northern shores to the west and N. W., and at every rocky promontory you have a new splendid view of narrow water between the mountains in front of you. During my journey in 1901 I considered them only a series of lakes, and I got the same impression as HUNTINGTON that their long bed in the valley was due to glacier action. But having seen neighbouring parts of the Indus valley at the end of 1907 and having studied the problem, I feel perfectly convinced that the Panggong Lakes *are* a river whose water has been dammed up by secular movements of the surface in connection with the rise of the mountain ranges, and that thus the theory of OLDHAM must be correct. There has been either a regular upheaval of the ground which was greatest in the west and which gradually diminished to the east leaving the region around Noh and Tso-nyak nearly untouched, or a sinking of the ground with its maximum in the east around Noh, and leaving the region of the threshold between the lake and the Drugub river unmoved. It seems improbable that the rise of the ground should have been a local phenomenon taking place only where the threshold is now situated, for then we should expect much greater depths in the western part of the Panggong-tso. My two sounding lines across the Panggong-tso proper started, the one from my Camp CXLV towards the S. 65° W., and the other from Camp CXLVIII towards the S. 26° W. The deepest point on the former line was 40 m., and on the latter 47,5 m., both nearly in the middle of the lake and at a distance of 25 km. from one another. The second line was at a distance of 17 km. from the western end of the lake, so very possibly the bottom of the lake basin may sink some meters to the N. W. before the definite rise begins towards the N. W. end of the lake and further to the threshold. Accepting, however, the 47,5 m. as the greatest depth of Panggong-tso, we find that the bottom of the valley, from the eastern shore of the Tso-nyak to this point sinks only 47,5 m. in a distance of 138 km. Taking a section of the neighbouring Indus we only need to travel 46 km. to find a sinking of 50 m., *viz.*, from my Camp CCLXI, Na-gangkal, 4229 m. high, to Camp CCLXIV, Lungkung, 4179 m. high.

Of course, the ground of the lake basins does not fall regularly from east to west, though as a rule the depth increases in that direction, and the deepest point measured in Panggong-tso is 16 m. deeper than the deepest point in Tso-ngombo. At four places between the different lake basins, the ground of the valley even rises above the surface of the lakes. Here DREW'S theory of the talus fans may no doubt be of use.

Gar-gunsa is at an altitude of 4287 m., Lungkung at 4179 m., both are situated in the straight Gartang-Indus valley and at a distance of 140 km. from one another;

nearly the same as the distance from the eastern shore of Tso-nyak to the point of 47.5 m. But in the case of the Indus valley the gradient is more than twice as steep, or 108 m.

There exists an extraordinary homology between the Shayok and Indus systems. These two rivers seem to have been arranged after one and the same pattern — if we regard the Panggong Lakes and the affluents of Tso-nyak as parts of the Shayok, as we are entitled to do from a historical point of view. The sharp knee of the Panggong-tso where the lake suddenly changes its E.—W. stretching to S. E.—N. W., corresponds exactly to the sharp bend of the Indus below Lungkung where the river pierces the Ladak Range. At a time when the Panggong-tso was a river continuing down to Shayok by way of the Drugub river, it also pierced



one of the Kara-korum Ranges. The Indus is certainly older than the Ladak Range as the latter shows itself nowadays. In the same way the Panggong valley is older than the Range that is pierced by the eastern half of the present lake. But it is clear enough that a lake could never pierce a range unless a powerful river had eroded its basin. The river was killed by the upheaval of the ground just N. W. of the present Panggong-tso, and thus the lake was formed. The latitudinal valley from Tsake-la to Chushul which enters the Panggong-tso just at its knee and which, from a tectonic point of view, is the continuation of the upper Indus and Gartang valley, corresponds to the valley of the Hanle tributary entering the Indus just at its sharp bend. It is obvious that this regularity and homology in the building of the valleys could not exist unless the mountains had been folded in a very regular way.

The accompanying diagram will give an idea of the direction and localisation of the differential earth movements that have taken place by the damming up of the Panggong lakes. The vertical scale is 100 times exaggerated, which means that

the diagram, with the same vertical height, should be pulled out 100 times in the horizontal to give the real relations.

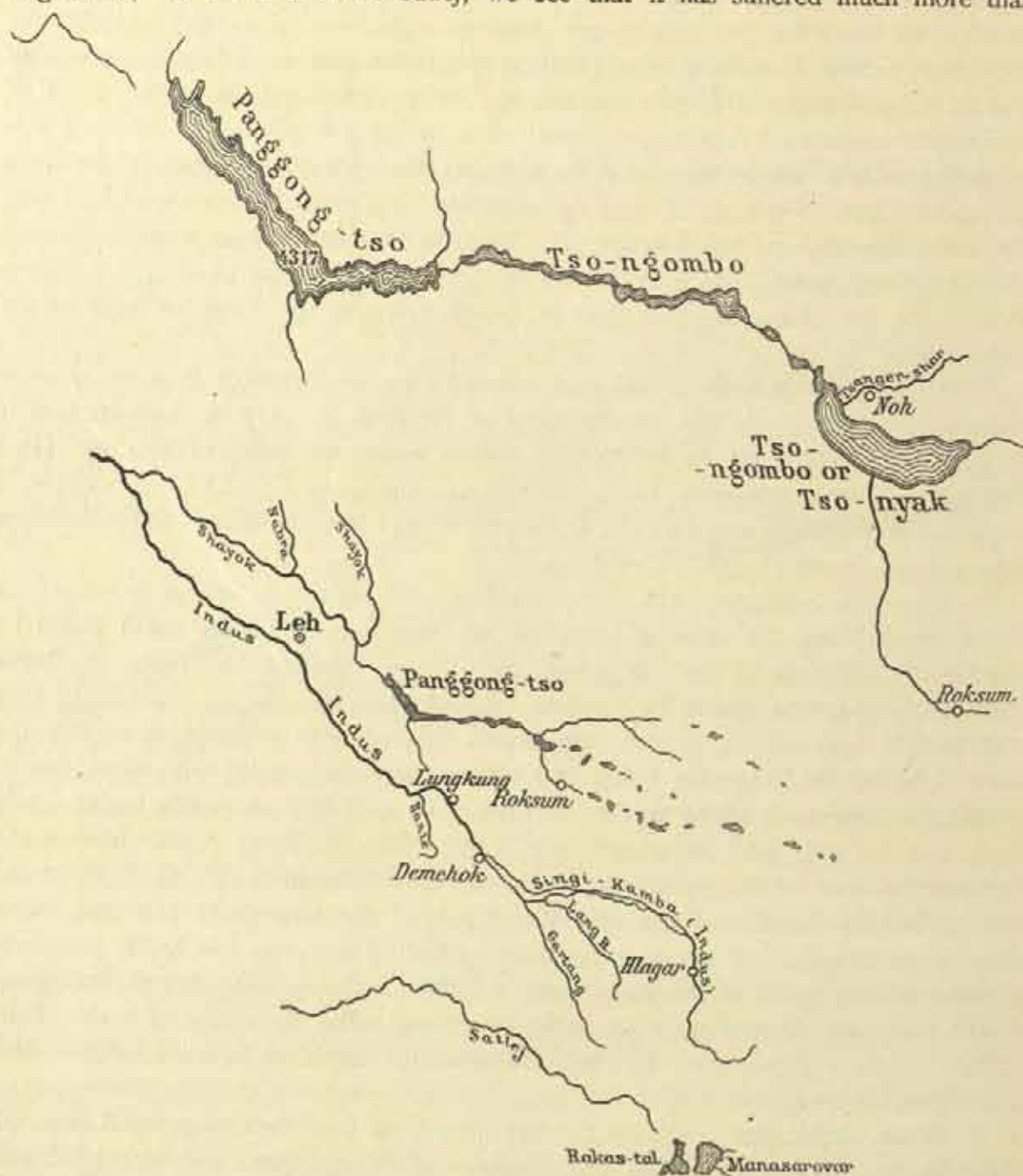
It shows that the Drugub, the Shayok and the Indus, between Drugub and Skardo, fall 1527 m. in a distance of about 300 km., *i. e.* as 1:196; and that the upper Indus, from Lungkung to a point on the Indus between Leh and Tikse, falls 965 m. in a distance of about 180 km., *i. e.* as 1:186. In both cases the fall of the rivers is therefore about the same. But above Drugub and Lungkung the parallelism ceases completely, and it is here that the upheaval, the rise of the crust, has taken place. From the Panggong threshold to Drugub, a distance of 38 km., the valley falls 455 m., or at a rate of 1:83; from Demchok to Lungkung, a distance of 70 km., the upper Indus valley falls only 95 m. or at a rate of 1:737. In these sections the fall of the Drugub river is therefore nearly ten times as steep as the upper Indus.

In the next sections to the east we find that the threshold is at an absolute altitude of 4329 m., and the eastern shore of Tso-nyak at 4317 m.; between both is the lake series, 155 km. in length and with a maximum depth of 47.5 m. Here the valley is thus practically level. At Hlagar (my Camp CCXLVI) the altitude is 4672 m., at Demchok 4274 m.; in a distance of 211 km. the Singi-kamba therefore falls 398 m., or as 1:530.

If now in connection with a continued mountain-folding activity a pressure from below should raise the crust at Demchok as the arrow shows, the result would be exactly the same as in the Panggong case. From Demchok to Hlagar the Indus and the Singi-kamba would be dammed up and changed into an exceedingly long and narrow lake which, as the little sketch map shows, would have exactly the same form as the Panggong Lakes and become perfectly parallel with them, that is to say, its uppermost basins would run from S. E. to N. W., its middle basins nearly from east to west, and its westernmost portion from S. E. to N. W. Just as the westernmost part of Panggong-tso has a tectonic continuation to the S. E. in the valley Tsake-la-Chushul, so the westernmost part of the lake above Demchok has a tectonic prolongation in the Gartang-Indus valley. There can hardly be conceived a more striking proof of the correctness of Oldham's theory, *viz.*, that the Panggong Lakes have been formed by a damming up of the valley by means of a rise of the ground in the region where the threshold separates the lakes from the Drugub river and Shayok system.

If the desiccation continues for any length of time the Panggong Lakes will dwindle, the connection between Tso-ngombo and Panggong-tso will be cut off, and the Tso-ngombo also will become salt. The same will be the fate of Rakas-tal and Manasarovar, and finally the small salt lakes will disappear. But precipitation is subject to periodical changes. If a moist period should obtain in the interior of Asia, the

Panggong and Satlej lakes would again increase and begin to drain to the Indus system, as they have done before. Comparing the «Panggong River» with its neighbours, the Indus and the Satlej, we see that it has suffered much more than



the two others. This is easy to explain from the fact that it is situated at the greatest distance from the margin of the mountains, and that a greater amount of moisture is captured by intervening ranges than in the case of the two others.

The erosion of a river works up-stream from the mouth to the source, and its ultimate goal is to give the riverbed the profile of a parabola. The erosive action is at its maximum where the slope is steepest. The Drugub river has a considerable erosive power which would increase during a moist period. It cuts down its bed in the direction of the Panggong threshold, and will finally cut through it, thus again capturing the Panggong Lakes and transforming them into a river. The ultimate goal of this action is to give the Tso-nyak — threshold — Drugub line in the upper profile of our diagram, the same appearance as the Hlagar—Demchok—Lungkung line in the lower profile. Lakes of the Panggong type are therefore very ephemeric phenomena on the earth.

CHAPTER LVIII.

THE OLD DRAINAGE OF THE SELLING-TSO — PANGGONG-TSO DEPRESSION.

We now turn to the period preceding the lacustrine epoch of the Panggong valley. Everybody who has travelled in the mountain valleys of the Indus and its tributaries will have noticed the enormous terraces raising their naked and sometimes nearly perpendicular walls on the banks of the rivers. In the first Chapter of Vol. IV of this work I briefly mention some of them, and in the same volume I have a few photos giving an idea of their appearance. Opposite p. 16 there is a photo from the Chang-chenmo valley at Pamsal showing, on the right side of the river, a fluvial terrace 50 m. high or more with sharply marked horizontal layers of shingle-and-gravel, sand and clay. The photo opposite p. 20 shows another part of the same erosion terrace a short distance above Pamsal, where it is cut through by a northern tributary. At p. 22 and p. 24 are photos from Gogra showing another example of well developed river terraces. And finally Pan. III in the same volume gives an excellent view of the Chang-chenmo terrace. A look at this panorama is quite sufficient to tell us what has taken place at an earlier epoch in this valley. The present river would hardly have had strength enough to cut down its bed with such enormous energy. Only the powerful river that flowed down the valley in post-glacial time could have been able to bring about such a result.

Regarding the river that is most interesting to us, *viz.*, the little Drugub tributary of the Shayok, the lower part of the old Panggong river, I made the following annotation at my first visit, in 1901: At the actual elbow, where the valley changes its direction (to S. W. between Muglib and Tanksi), we observed, at a good 100 m. above its bottom, some especially well-defined terraces, interrupted at only a couple of places by fissures and gravelly screes. During the period in which this valley served as the outlet conduit of the Panggong-tso, and when the volume of water that streamed down it was immense in comparison with that which it now carries, the valley was excavated with great energy, the effect being such as nobody would

for one moment attribute to the existing little brook, even making allowance for its summer highwater. It is clearly from the same period also that the side-terraces date; and it is noteworthy that they have been built up with especial distinctness at the elbow on the right side of the valley, where the full force of the current spends itself. There too the rocky walls are precipitous, whereas on the opposite or left side they slope gently down to the bottom of the valley. From that point the terraces continue all the way down to Drugub, growing larger and more distinctly defined as they proceed, so much so indeed that they not seldom constitute the peculiar and salient feature of the landscape.¹

Just a little above the point where the Drugub river joins the Shayok, there is at the right side of the latter a strikingly developed erosion terrace or rather two terraces, of which I have two photos on p. 398 of Vol IV, Scientific Results, and a third opposite p. 400.

It is not only in the brook of Drugub, in the Shayok and Chang-chenmo and other tributaries in this region that gigantic remains have been left from a time when enormous quantities of water flowed down through these valleys. Such monuments, though on a smaller scale, are also to be found in valleys through which flow brooks which are affluents to the Tso-nyak, and thus ultimately to Panggong-tso.

My Camp CXXXIII (1901) is at a distance of 70 km. east of Tso-nyak.² Half a day's march east of that Camp there were unmistakable traces of an old dried-up lake in the great latitudinal valley. South and S. E. of the Camp was a well-defined terrace, 4 or 5 m. high (Cf. photo p. 254, Vol. IV, Scient. Results). The altitude of the camp was 4597 m., while the next camp to the west, Camp CXXXIV, was at 4587 m. In travelling here I wrote: The whole of the lower part of the slope looks as if it had been shorn away. It is not, however, continuous, but is sometimes interrupted by recently formed gravelly screes. Yet even the bigger screes that block the outlets of the transverse glens have been cut through in a similar manner, proving that the sedimentary matter which has been washed down across the scree since the shearing took place, has not been sufficient to cover over and obliterate the old terrace, which was formed at a time when the climate was wetter than it is now. During the succeeding day's march the shearing was even more pronounced. This is, I have no doubt, the last trace of the effluent from the lake, which, as a consequence of the configuration of the ground, crept close in to the southern base of the range, where its erosive activity gave rise to the terrace in question, and at an earlier epoch, where there was a copious inflow into the lake, the erosive energy of its effluent

¹ Scientific Results, Vol. IV, p. 350.

² This name seems doubtful. I only heard the name Tso-ngombo, «The blue lake», for the fresh-water basins. It may, however, serve to point out which particular basin of Tso-ngombo I mean.

must have been especially energetic. During the course of time the volume of the lake's effluent grew less and less, until at last it was a mere brook that crawled along the base of the terrace, and now even the brook has ceased to flow. When that came to pass, the lake was cut off and became salt. Now it has entirely disappeared.

The brook which eroded this terrace was a tributary to the Tsanger-shar. At Camp CXXXVI, 4407 m., which is 25 km. from the Tso-nyak, the front of a talus fan from a northern tributary had been exceedingly sharply cut by the Tsanger-shar, and formed a tremendous wall reminding one of those in the Chang-chenmo valley.¹

Thus through the latitudinal valley from Camp CXXXIII to Tso-nyak which I followed in 1901, there once flowed a very mighty feeder of the Panggong Lakes. We have found high and well-defined fluvial terraces both above the Panggong Lakes, in the Tsanger-shar and below the lakes in the Drugub brook and Shayok River, and we have now to examine whether any old terraces also are to be found along the shores of the lakes.

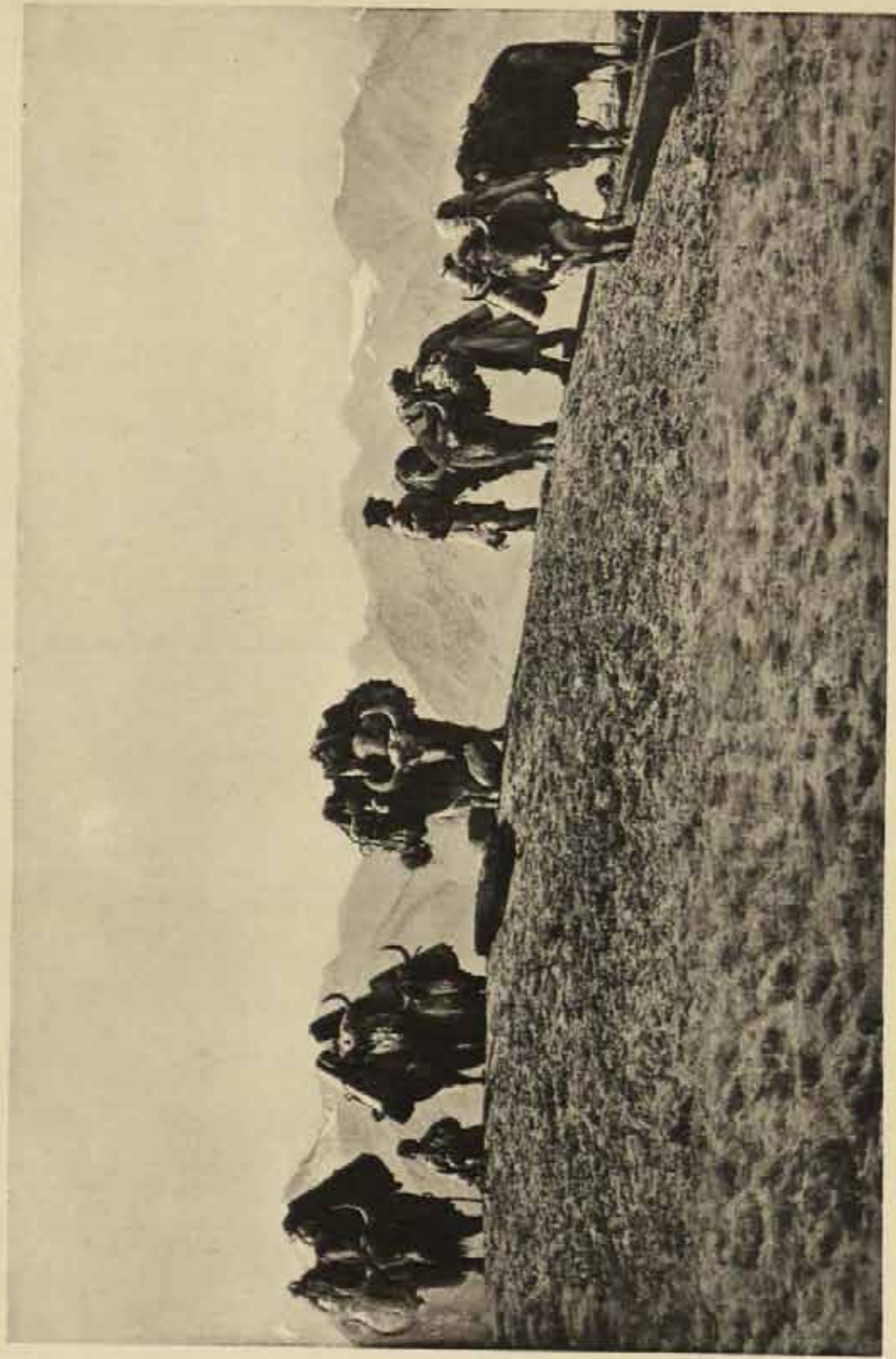
And indeed there is an abundance of well-defined terraces and beach-lines! HENRY STRACHEY observed them in 1848 and says: »All along the banks of the lake there is a well-defined zone of horizontal watermarks, extending to a height of perhaps 70 feet above the present surface, formed both by calcareous concretions and by erosions on the foot of the marginal rocks, corresponding marks being also visible in parts of the alluvial shore; and the uppermost of these lines no doubt marks the level of the existing watershed at Donzho (the threshold).»²

But these old marks are no fluvial terraces; they are as STRACHEY says, beach-lines. They are not formed by the action of erosion along a river, but by the abrasion of waves and ice in a lake. As this lake has subsided gradually by reason of desiccation, the beach-lines indicate former niveaux of the lake. During the distant epoch when a gigantic river flowed through the Panggong valley, mighty fluvial terraces of the same kind as we find along the Shayok, Indus and Chang-chenmo, were built up along its banks. It is obvious that the rising of the surface which dammed up the valley, obliterated these terraces, for it would be absurd to assume that the rise could have been so regular as to save the terraces from destruction. The beach-lines of the lakes are very regular and absolutely horizontal.

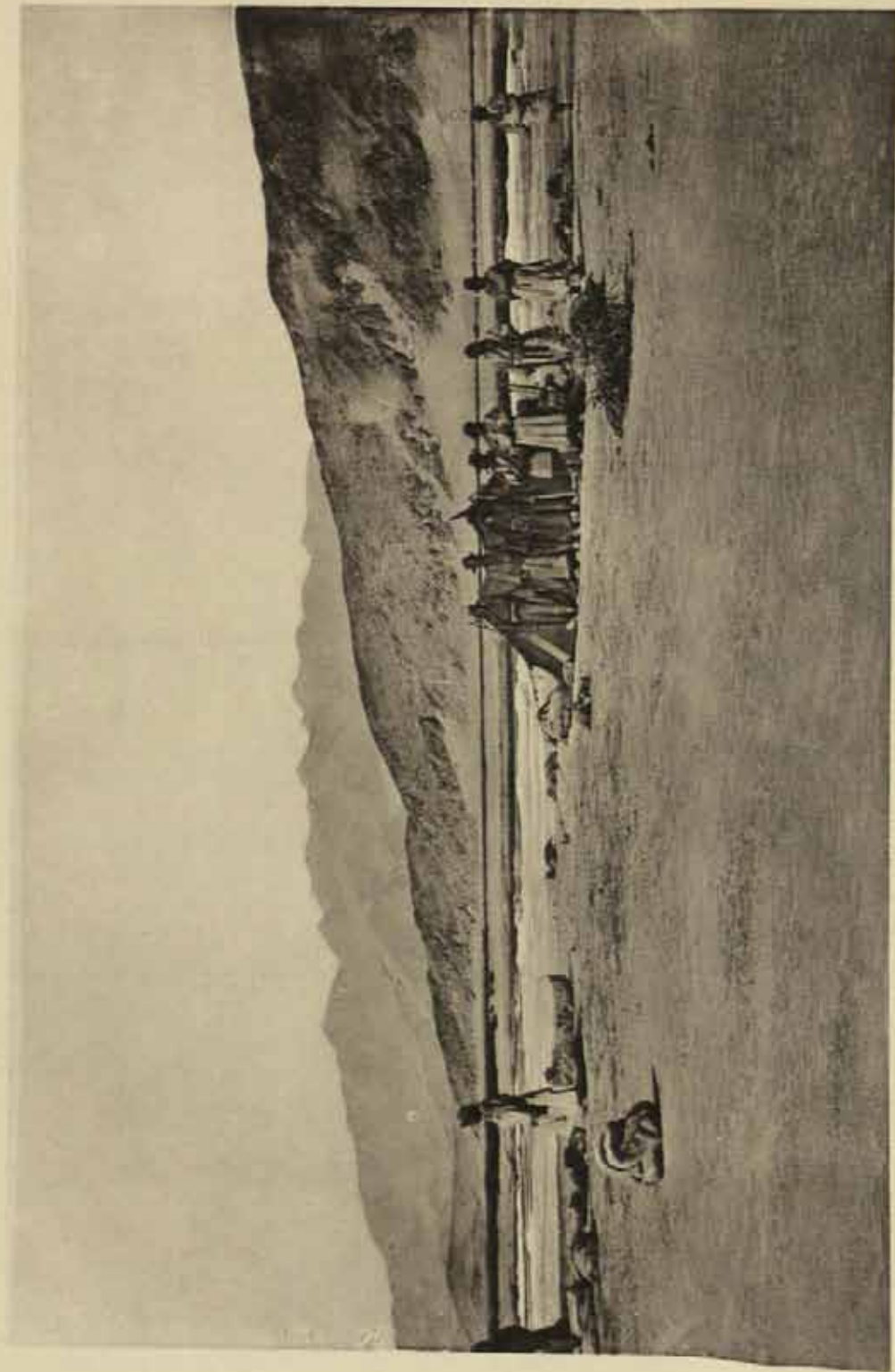
In the vicinity of Camp CXXXIX at Bal on the northern shore of the eastern Tso-ngombo where the mountains come down in precipitous walls, old beach-lines are often observed. In one place there are five such, rising one above the other, and to some of them there were corresponding beach-lines on the southern shore, showing up with remarkable distinctness as dark and perfectly horizontal lines. The

¹ Opposite p. 264, *op. cit.*, there is a photo of this terrace.

² *Physical Geography of Western Tibet*, J. R. G. S. Vol. XXIII, p. 47, 1853.



IN THE MOUNTAINS SOUTH OF PANGGONG-TSO.



PUKTSE, CAMP 262, ON THE UPPER INDUS.

highest terrace visible on the northern shore reached an altitude of 11.5 m. above the level of the water; the lowest, which was 5 m. above the lake, was at this spot of exceptional beauty and distinctness but it soon came to an end.¹

From Camp CXLI (1901) I measured the only beach-line visible on the slope of the northern mountain-side, and found it to be 19.5 m. above the lake. From Camp CXLIV I made another profile towards the S. E. from the river between the two lakes, and found three very well-developed terraces or beach-lines, the first at an altitude of 13 m., the second at 21.5 m., and the third or highest at not less than 54 m. This was the most distinct of all, so that the lake at this niveau must have maintained its position for a comparatively long period.

The result at which we arrive is the following: The fluvial terraces in the Muglib-Tanksi-Drugub valley are so gigantic that they can only have been deposited and cut through by a river as great if not greater than the greatest rivers now having their sources in Tibet. Such a river must have had a length that might be compared to the present length of the Himalayan course of the Tsangpo. Therefore it is *a priori* necessary that the valley which is now occupied by the Panggong Lakes at one time contained, and was eroded by that river. But even the 155 km. of the Panggong valley make a short river which is not in proportion to the dimensions of the fluvial terraces. The river must have come from far away in the east and perhaps crossed the whole of what is now the self-contained Tibetan plateau-land.

At the epoch when the Transhimalayan and Himalayan folds were raised and assumed approximately their present structure, the country to the north was also folded into a system of mighty mountain ranges. The rivers were older than the mountains, and could therefore by their erosive power maintain their originally tectonic valleys. As long as the precipitation was copious and the rivers carried great volumes of water, their erosive power was strong enough to cut down the river beds in spite of the differential movements of the surface which, as a quite natural phenomenon, accompanied the mountain-folding activity. But the climate gradually became more and more dry, and the erosion power no longer was sufficient to cut down the river beds at the same speed as the movements of the crust raised the ground in different parts of the country. For a long time the Panggong River victoriously defended its free way to the sea against the energetic rising of the threshold in its course. A lake was formed, and the still voluminous river issuing at its N. W. end, worked down its bed through the rising threshold. The beach-line at 54 m. above the present level of the lake proves that this fight was successful as long as the effluent was still a considerable river. But finally the river had to give up, the lake became isolated and has now a slight degree of salinity. The reason for this great change

¹ Op. cit., p. 280. From p. 264 to p. 346 of the volume quoted, there are many photos showing the beach-lines, e. g. p. 282, 300 and 306.

was of course that the affluents in the upper part of the Tso-ngombo dwindled to mere brooks; a consequence of the increasing desiccation.

In the same way the upper courses of the westerly flowing rivers which once crossed the interior of Tibet were disturbed by the differential movements of the ground in their valleys, interrupted and forced to feed self-contained lakes which in time became salt. In some cases such lakes may have had outlets across rising thresholds, but were finally completely isolated. In other cases parts of a river flowing west may have been forced to flow eastwards.

On p. 500 I have mentioned some of the self-contained lakes on the depression line between Selling-tso and Panggong-tso. In the following list I have entered 18 points on the same line, not all of them being lakes. The altitudes of 12 of these points have been determined by me, 4 by LITLEDAL, one by DEASY and one by NAIN SING. The last mentioned Pamar-tso, has in the list 4350 m., as Nain Sing's 4191 m. are certainly too low. Turgu-tso is determined by Deasy, Tsemar und the three next by Littledale.

Selling-tso	4611 m.	Camp CXVIII	4454 m.
Chargut-tso	4615 »	Tsolla-ring-tso	4440 »
Addan-tso	4615 »	Camp CXX	4406 »
Dagtse-tso	4544 »	Turgu-tso	4340 »
Tongka-tso	4500 »	Tsemar	4636 »
Pamar-tso	4350 »	Rawang	4339 »
Oman-tso	4507 »	Dojur-tso	4355 »
Lagoon (E. of Jim-tso) .	4458 »	Roksum	4371 »
Jim-tso	4495 »	Panggong-tso	4317 »

All these points are situated on a line which is slightly bowed towards the south, and parallel with the general stretching of the mountain ranges to the north and south of it, and also with the Transhimalayan and Himalayan systems.

It is a striking feature of this list that the absolute altitudes of the depressions as a rule become lower from east to west. Selling-tso is nearly 300 m. higher than Panggong-tso, and the whole valley gradually slopes westward. The exceptions to this rule may be regarded as the results of the differential movements of the crust. The slope is extremely slow. If the distance from the mouth of Sachu-tsangpo in Selling-tso to the eastern end of Tso-ngombo is 930 km., and the difference in altitude 294 m., then the rate of fall will be only 1:3163. But adding the length of Panggong-tso and of the Drugub river, the length of the valley will be 1108 km., the difference in altitude 737 m., and the rate of fall 1:1503. And adding the lowest part of Sachu-tsangpo from the point where I crossed it in 1901, which is 150 km. from the mouth of the river in Selling-tso, the distance becomes 1258 km., the

difference in altitude 990 m. and the fall as 1:1270. Extremely gentle gradients of fall of the Tibetan rivers are not rare. Along some of my marches in the valley of the Upper Indus between Gartok and Lungkung, I found gradients of 1:3000, 1:2375, 1:2100, 1:3075, 1:4000 and 1:2471¹ but taking the whole distance between the two places mentioned, the fall proved to be 1:712; the distance is here 205 km. and the difference of altitude 288 m. From Umboo on the Upper Tsangpo (4702 m.) to a point opposite to Shigatse, on the river, (3815 m.), the distance is 680 km. and the rate of fall 1:766.

Our store of reliable altitudes from the interior of Tibet is not great. But even those in our possession are sufficient to prove the existence of a remarkable depression from Selling-tso to Panggong-tso, an unexpectedly deep depression crossing the whole of this extensive plateau-land and bordered to the north and to the south by more or less continuous mountain ranges or systems of ranges. In the following list I have entered 10 passes in the mountain system situated just north of the depression in question, from west to east. The names of the travellers responsible for the altitudes are also given:

Marsimik-la (Hedin)	5593 m.	Chardo-mirido (Rawling)	5029 m.
Demchur-la (Zugmayer)	5580 »	Nameless pass (Bower)	5209 »
Spanglung (Zugmayer)	5180 »	Jumrang-lophangs (Hedin)	5032 »
Nameless pass (Deasy)	5051 »	Palou-la (de Rhins)	5134 »
Chukyar (Deasy)	5225 »	Nameless pass (Bower)	5718 » ²

The mean altitude of these passes is 5275 m. The following list contains the altitudes of 10 passes in the mountain system south of the depression:

Dundok (Deasy)	5090 m.	Nameless pass (Littledale)	5004 m.
Shelkongda (Littledale)	4877 »	Rejen-la (de Rhins)	5094 »
Sangchen-la (Hedin)	5356 »	Burben-la (Bonvalot)	5389 »
Kilong-la (Nain Sing)	5550 »	Ta-tsang-la (de Rhins)	5050 »
Lamlung-la (Hedin)	5179 »	Tsanyi-la (Bonvalot)	5150 »

The mean altitude is here 5174 m. As the depression itself has an average altitude of only 4464 m. we find that it signifies a very deep valley as compared with the surrounding plateau-land and especially with the mean pass altitudes in the ranges bordering it to the north and south. The northern passes are no less than 811 m. above the depression, and the southern passes 710 m.

It may seem an audacious theory that this long valley should ever have been able to drain off to the Indus. But both the morphology of the surrounding country

¹ Cf. Vol. IV p. 414, of the present work.

² Probably too high.

and the hypsometric relations make it possible that this has been the case. The length of the valley, some 1260 km., should not be surprising, remembering that the length of the Tsangpo from its source to the point where it begins to break through the Himalaya is nearly exactly the same, or 1200 km., in a fairly straight line. Very long latitudinal valleys are characteristic and a natural feature in a folded land as Tibet. The Upper Indus flows to the north-west for some 850 km.

The Sachu-tsangpo which takes its origin from the Tang-la mountains far in the east, would thus have been the source branch of this long river which then proceeded westwards from the present region of Selling-tso to Dagtse-tso, Tongka-tso and other lakes on the way to Panggong-tso. At the time of the existence of the river, the appearance of its valley must have been like that of the Tsangpo valley as it now is. The difference in altitude between the valley and the mountain range north and south of it was greater than now, as the destruction of the mountains by denudation had not proceeded so far, and as the present self-contained basins had not yet been filled with debris. And still the difference in altitude between the lowest points on the ranges, *i. e.* the passes, and the lowest points in the valley, *i. e.* the lakes, is, as we have seen, some 700 and 800 m. From the beginning of the desiccation period which still is proceeding in the direction of increasing aridity, the atmospherics; wind, weather, frost, insolation, etc., act to diminish the relative altitudes, destroying the rocks and demolishing the ranges into mere ruins, and, because of the isolation from the sea, filling up the basins with solid material in the finest degree of division. The ultimate goal of this activity is to obliterate the hills altogether and to bring them at one level with the former depressions, then filled with the very debris of the former mountains. The interior of Tibet would then become an ideal plateau with slightly undulated, soft ground, without hills, lakes or rivers.

The only agencies that could counteract this kind of development would be an increasing folding activity of the crust and an increasing precipitation such as prevailed during the early post-glacial epoch. Even the latter of these agencies alone would bring about the most revolutionary consequences. The lake basins of the plateau-land would get filled to their brims, and overflow across the lowest threshold in their peripheries. Neighbouring lakes would become joined by river arms, and new hydrographic systems would come into existence. And finally every one of these systems would find its way to the ocean. By the increasing erosive action of the rivers, tremendous fluvial terraces would become carved out through the mighty beds of gravel, sand and dust now filling the basins. The exterior peripheric rivers, *i. e.* the feeders and source branches of the Indus, the Tsangpo, the Indo-Chinese rivers, the Tsaidam and Tarim rivers, would erode their beds with an energy that gradually would remove the different sources nearer and nearer to the heart of the present plateau-land. On their way thither they would sooner or later meet the

outflows from the interior hydrographic systems and capture them, emptying the lake basins one after another. The interior peripheric rivers, such as the Sachu-tsangpo, Tagrak-tsangpo, Targo-tsangpo, Buptsang-tsangpo and others, would take part in the fight for the water-parting, and the lakes whose affluents they are would grow considerably and enter into communication with one another until they, as well as those to the north, found outlets to the ocean.

To return to the long feeder of the Indus which before the beginning of the arid period would have flowed from the heights of the Tang-la and through the present basins of Selling-tso and Panggong-tso, this theory does not seem to be more audacious than another, regarding the Tsangpo, and described by BURRARD as follows¹:

»The remarkable feature of the Brahmaputra in Tibet is the tendency of its feeders to flow in a direction opposite to that of the trunk river. If but one feeder had been observed to take a course contrary to that of the river, the phenomenon might have been attributed to some local topographical peculiarity; but where all the principal affluents of a long section of the river are found to follow the same contrary course, it becomes evident that the Brahmaputra must at no distant time have flowed from east to west in Tibet, and that its tributaries were developed during that period of its history — . . . in our opinion the evidence furnished by its feeders is conclusive; the Brahmaputra formerly flowed through Tibet from east to west. It is not possible to express an opinion at present as to where it escaped through the Himalaya: it may have flowed over the Photu Pass and through the defile of the Kali Gandak; it may have passed through the basin of the Karnali, and it may have followed the present Himalayan course of either the Satlej or the Indus; arguments can be adduced to show that each of these hypotheses is worthy of future investigation, but with our present knowledge no conclusion can be reached.»

The curious fact that the tributaries take a course contrary to the great river is true only for the section from Shigatse to the point where the Brahmaputra begins to pierce the Himalaya. Above Shigatse and to the source of the Tsang-po, the abnormal course of a tributary must be regarded as exceptional. All the uppermost feeders have a quite natural course in relation to the trunk river, and so have the Gyang-chu, the Tsa-chu, the Chaktak-tsangpo, the Raga-tsangpo, the Rung-chu, and the Mū-chu; the latter, however, coming in under a right angle. The fact that the Photu-la, my Kore-la, the extraordinary low depression in the Ladak Range, is only 250 feet higher than the Brahmaputra supports, according to Burrard, the evidence that the river once escaped from Tibet along the present course of the Kali Gandak, the immensely deep gorge of which cannot have been eroded by its present river.

¹ A Sketch, p. 155.

There is much that appears in favour of this theory, much more than for the alternatives of an outflow by the Indus or the Satlej, especially as the canyons of the Satlej may easily have been eroded by this river itself, without the assistance of the Tsangpo. I have crossed the Photu-la or Kore-la twice, and standing on its saddle I said: We have mounted only 315 feet from the river to the Kore-la, where the height is 15,292 feet. And from the pass there is a headlong descent to the Kali Gandak, an affluent of the Ganges. By means of a canal cut through the Kore-la the uppermost Brahmaputra might be turned into the Ganges But the changes here indicated will some time come to pass without artificial aid, for the tentacles of the Kali Gandak are eating back northwards into the mountains much more quickly than the Tsangpo is eroding its valley. Some time or other, perhaps in a hundred thousand years, the Ganges system will have extended its tentacles to the bank of the Tsangpo, and then will be formed a bifurcation which, in the course of time, will bring about a total revolution in the proportions of the two rivers and their drainage areas.¹

However, if the theories thus set forth by Burrard be admissible we would get a river much larger than the one I have presumed, taking its origin in the Tang-la mountains and arising to the Shayok and Indus by way of the Panggong lakes. And admitting differential movements of the crust, there would be nothing surprising in the fact that the Bogtsang-tsangpo now flows eastward while the Addan-tso and Chargut-tso also drain to the east.

There is, however, an alternative way of assuming the outflow from this long valley. The high degree of maturity of the Bogtsang-tsangpo points to great age. Even nowadays the Selling-tso is a recipient of rivers both from the east and west. It is perhaps a more plausible theory that only the western section of the great latitudinal valley drained to the Indus from a water-parting in the region of the Shakangsham, and that the eastern section found an escape to the Nak-chu. The Sachu-tsangpo would then, together with its tributary from the Shakangsham, have turned in a very sharp bend from the region of the present Selling-tso eastwards *via* the lakes Pongok-tso, Burben-tso and Ngamdo-tso-nak, from where it must have turned southward to the Nak-chu. This second alternative has been adopted on the little map of mountain ranges and ancient rivers at the end of this volume.

Whether the one or the other of these two theories is more likely to be correct is not as important as is the existence of a depression running through the whole of interior Tibet and having every appearance of a gigantic river-bed, disfigured, it is true, by differential movements, by denudation and weathering and by the filling up of its trough with immeasurable quantities of subaerial and aquatic sediments.

¹ Transhimalaya, Vol. II, p. 78.

CHAPTER LIX.

THE DEPRESSIONS ALONG THE NORTHERN AND THE SOUTHERN BASE OF THE TRANSHIMALAYA.

Proceeding one step to the south we come to the most interesting and attractive latitudinal depression in the whole of the Tibetan plateau-land; *vis.*, the one situated along the northern base of the Transhimalaya, and at the southern base of the mountain system bordering the Selling-tso — Panggong-tso depression on the south. To this lacustrine depression belong the famous Tengri-nor or Nam-tso, the Lake of Heaven, which was known in Europe some 200 years ago, a series of lakes discovered by NAIN SING in 1874, and another series discovered by me in 1908.

A few Transhimalayan lakes have not been entered in the following list, *vis.*, the Shuru-tso (4725 m.) and Poru-tso (5094 m.), as they do not belong to the depression, but are situated in the interior of Transhimalaya itself; the Karong-tso, as my route is situated at some distance from its northern shore; the Tabie-tsaka, as I have only seen it from a great distance and only can tell that it is at a lower altitude than Tarok-tso (4627 m.); the Marchar-tso as it was only seen at a distance of 6 miles from the north by Nain Sing and at 4 miles from the S. W. by me (January 1907, cf. the second photograph opposite p. 342, Vol. III). Ring-tso, Bul-tso, Mokieu-tso and Chikut-tso (Tsiku-tso) are all left at some distance to the north of Nain Sing's route; if the Pundit's altitudes along his route are correct these lakes must be at a lower altitude than Ngangtse-tso and about at the same as Tengri-nor. South of Ring-tso Nain Sing has an altitude of 4712 m., south of Bul-tso 4681 m., south of Mokieu-tso 4510 m., and south of Chikut-tso 4651 m.

The remaining 10 lakes of the great depression whose altitudes are known are the following, the names within brackets being the explorers responsible for the observations:

Tengri-nor (de Rhins, a. o.)	4630 m.	Teri-nam-tso (Hedin)	. . . 4684 m.
Shudun-tso (Littledale)	. . 4861 »	Chunit-tso (Hedin)	. . . . . 4747 »
Kyaring-tso (Nain Sing)	. . 4502 »	Tarok-tso (Hedin)	. . . . . 4627 »
Ngangtse-tso (Hedin)	. . . 4694 »	Shovo-tso (Hedin)	. . . . . 4784 »
Dangra-yum-tso (Hedin)	. 4646 »	Nganglaring-tso (Hedin)	. 4746 » ¹

The mean altitude of the ten lakes is 4692 m. Omitting the three unreliable lakes, Shudun-tso, Kyaring-tso and Dangra-yum-tso, the mean altitude becomes only 10 m. higher, or 4702 m.

The mean altitude of the known passes in the range north of these lakes, we have already found to be 5174 m. The depression of the ten lakes is therefore 482 m. below the mean pass altitude to the north. But as the passes signify the lowest points of a range, the relative mean crest altitude of the latter will of course be much greater above the depression. On the other hand, the lakes are also the lowest points of the depression, and therefore the two values are commensurable.

The following is a list of the known first-class water-parting passes of the Transhimalaya. They are 32, of which only 11 are known as to their altitudes; of the existence of 19 passes I was informed by the natives without having an opportunity to visit them. I only know their situation approximately. The names within brackets indicate the discoverers; in some cases the same pass has been used by two or three explorers.

Shiar-gang-la (A—K—, 1881)	. . . . . — m.
Shang-shung-la (Huc and Gabet, 1846) — »
Dam-largen-la (Nain Sing, 1873)	. . . . . 5152 »
Goring-la (Littledale, 1895)	. . . . . 5972 »
Tsebo-la — »
Shugu-la — »
Khalamba-la (Nain Sing, 1872, de Lesdain, 1905)	. . . 5244 »
Sela-la (Hedin, 1907)	. . . . . 5506 »
Chang-la-Pod-la (Hedin, 1907)	. . . . . 5573 »
Sha-la — »
Angden-la (Hedin, 1907)	. . . . . 5643 »
Tsalam-nakta-la — »
Dombe-la — »
Nakbo-kongdo-la — »
Sangmo-bertik-la (Hedin, 1908)	. . . . . 5820 »

¹ The altitude of Shudun-tso is certainly too high, and that of Kyaring-tso too low. The altitude of Dangra-yum-tso is unreliable, as I derived it from calculation and not from direct observation. My 4646 m., however, agrees well with Nain Sing's 4657 m. at a very short distance from the northern shore.

Saggo-la	— m.
Dicha-la	»
Samye-la (Hedin, 1908)	5527 »
Dsalung-la	»
Lungmar-la	»
Pechen-la	»
Lungnak-la	»
Yor-la	»
Ganglung-la	»
Men-la	»
Pedang-la	»
Gäbbyi-la	»
Yülung-la	»
Tarkyang-la	»
Surnge-la (Pundit ?, Hedin, 1908)	5276 »
Tseti-lachen-la (Hedin, 1907)	5466 »
Jukti-la (Nain-Sing, 1867, Calvert, 1906, Hedin, 1907)	5814 »

The mean altitude of the 11 determined passes on the great water-parting is therefore 5545 m., or 853 m. above the mean altitude of the lake depression to the north of it. Comparing these figures with those we have already got regarding the Panggong—Selling-tso depression, we obtain an excellent idea of the general hypso-metric relations:

The mean altitude of the mountain system north of the Selling-tso—Panggong-tso depression	5275 m.
The mean alt. of the Selling-tso—Panggong-tso depression	4464 »
The mean altitude of the mountain system south of the Selling-tso—Panggong-tso depression	5174 »
The mean altitude of the Nganglaring-tso—Tengri-nor depression	4692 »
The mean altitude of the passes on the great water- parting of the Transhimalaya	5545 »

This means a general rise of the ground towards the south. The Transhimalayan passes are higher than those of the two other ranges, and the southern lake depression is no less than 230 m. higher than the next depression to the north. There is also a great morphological difference in the orographical features between the two northern mountain systems and Transhimalaya. On a journey across the Tibetan plateau-land the two first-mentioned systems are easily crossed each in one pass, whereas the Transhimalaya is usually crossed in two or more passes of which, of course,

only one is situated on the great water-parting. All three systems are gigantic folds separated from one another by the lake depressions. But the Transhimalayan fold is in a much higher degree than the two others subdivided in a series of secondary folds forming a complicated labyrinth of ranges with secondary depressions between them. Therefore the Transhimalaya has a very great number of secondary passes more or less used by pilgrims, merchants, gold-diggers, officials, nomads and hunters. In the following list I have entered 30 secondary passes which are only the most important of those I have crossed and determined. They are arranged chronologically as I passed them on my journey:

Chapkar-la	5326 m.	Lamo-latse-la	5426 m.
Pongchen-la	5371 »	Bokar-la	5178 »
Shib-la	5349 »	Kinchen-la	5441 »
Chesang-la	5474 »	Lamlung-la	5118 »
Dangbo-la	5250 »	Gyāgong-la	5490 »
Ta-la	5436 »	Damche-la	5418 »
Chumar-la	5108 »	Goa-la	5298 »
Tarbung-la	5267 »	Lungkar-la	5570 »
Bāng-la	5237 »	Chuka-la	5320 »
Sao-lungring	5387 »	Surla-Kemi-la	5832 »
Ravak-la	5227 »	Tela-mata-la	5160 »
Kichung-la	5504 »	Tayep-parva-la	5452 »
Kānglung-la	5528 »	Pu-karu-la	5278 »
Dolma-la	5669 »	Kyangyang-la	5157 »
Tseti-la	5628 »	Ding-la (Chargo-ding-la)	5885 »

The mean altitude of these passes is 5393 m. Five of them, *viz.*, Dolma-la, Tseti-la, Lungkar-la, Surla-Kemi-la, and Ding-la, are higher than the mean altitude of the passes on the great water-parting. And two of the secondary passes, *viz.*, Surla-Kemi-la (5832 m.) and Ding-la or Chargo-ding-la (5885 m.), are higher than the highest passes I ever crossed on the great water-parting; the latter being the Jukti-la (5814 m.) and the Sangmo-bertik-la (5820 m.) The highest of all Transhimalayan passes so far known is the Goring-la, which according to LITTLEDALE has an altitude of 5972 m. and is situated on the great water-parting on the range of Nien-chen-tang-la.

The increasing altitude from the interior of the plateau-land towards the south can also be observed in the heights of the peaks. On the interior ranges there are hardly any peaks that can be compared with those of the Lunpo-gangri or Nien-chen-tang-la. The highest peak RYDER measured north of Lhasa had an altitude of 7088 m.¹

¹ This is probably the Charemaru, to which Littledale gave an altitude of 7364 m., and Grenard 7150 m.

while another was 6555 m. high. On the Lunpo-gangri, WOOD determined several peaks of about 6700 m. From Tradum, Ryder saw a peak belonging to the same system and having an altitude of 7058 m. These belong to the same group of peaks I saw from the north, and of which I have several illustrations in Vol. III.¹ That means that on the Transhimalaya there are peaks rising nearly 2400 m. above the depression along the northern base of the system.

Now the question arises: what was the hydrographic arrangement in the depression north of Transhimalaya during the wet period preceding the period of beginning aridity, desiccation and formation of self-contained plateau-basins and steppes? Considering, to begin with, only the western half of the great depression we find a series of small rivers each of them having its source on the northern side of the great water-parting, and each of them being the affluent and feeder of a saltwater lake. The Soma-tsangpo goes to Teri-nam-tso, the Buptsang-tsangpo to Tarok-tso, the Pedang-tsangpo to Shovo-tso, and the Sumdang-tsangpo to Ngang-laring-tso. Although these lakes, as all other lakes in the interior of Tibet, are subject to the general law of desiccation, the inflow of fresh water to them may be said to be abundant enough to compensate for the evaporation from the lake. Between the river and its lake there exists a state of equilibrium. During the summer when the snows and ices melt and occasional rains fall, the rivers rise and carry down so much water that they sometimes may be crossed only with difficulty and at many places not at all. Then the lakes rise to their maximum level. In the late autumn the melting and the rains cease, the rivers dwindle and the surfaces of the lakes sink. In the winter mere brooks come down under the ice, but then the lakes themselves are frozen and the evaporation diminished. Thus there is an annual period of rise and fall in the lakes. There is also a period of a higher degree, *viz.* the one that is registered by the outflow of the Manasarovar. And finally we have the great period of general desiccation.

What would happen if the desiccation ceased and the climate again became more and more moist? The Soma-tsangpo would increase and many other, now temporary, brooks would by and by grow to permanent rivers. The Teri-nam-tso would expand in all directions. To the north and south where the mountains are close upon the present lake the shore-line would be less changed. In the east the lake would meet an obstacle in the hills separating its basin from that of Dangrayum-tso. To the west a rise of 9 m. only would bring the western shore 21 km. westwards to Mendong-gompa, to which place the mouth of the Soma-tsangpo would be removed. By increasing moisture the whole Nevem valley would get filled and the overflowing water would continue W. N. W. always following the lowest

¹ I will deal with my own observations of their altitudes in a later chapter.

depressions and finding its way through Bongba-changma in the region north of Chunit-tso where, not far from Nila-yung-karpo, the altitude is only 4580 m., and N. W. of which there is a lake probably at a still lower altitude. The water would continue to flow further W.N.W. in the direction of the depression indicated by the salt lake Tabie-tsaka, where the altitude at any rate is lower than at Tarok-tso (4627 m.). Then we are lost in unknown country. But this country is no doubt filled up with N.W.—S. E. stretching ranges and valleys between them, and there are probably depressions and perhaps even lakes. The superfluous water would seek its way through the region north of Nganglaring-tso (4746 m.) where probably depressions as low as Tabie-tsaka will be found. The next region crossed by the escaping water would be the district of Yumba-matsen and the depressions of the lakes Dhubuk-tso and Karmo-tso, and finally the Singi-kamba or uppermost Indus would be reached—perhaps at Shildong, where the Indian maps give an altitude of 4465 m.

This, or something of the same kind, is what probably would happen upon the return of a pluvial epoch. The reason why I have left Chunit-tso, Tarok-tso, Shovo-tso and Nganglaring-tso to the south of the presumed river is that the course I have indicated seems to follow a latitudinal valley, of which the Nevem valley is a part, and which is for the rest unknown. However, on account of the increasing precipitation, every one of these lakes as well as the Karong-tso and Poru-tso would be captured by the new river system. The Tarok-tso would be filled, and its effluent would join the new river, and the same would sooner or later be the case with the other lakes.

It is a curious fact that the Soma-tsangpo and the Sumdang-tsangpo flow from S. E. to N. W. as if they had once been southern tributaries to a great westwards flowing river with which their courses formed more or less acute angles. On account of the proceeding desiccation and of the differential movements of the surface, the Soma-tsangpo and the Sumdang-tsangpo have, in their lower courses, been forced to make sharp bends and return to the east.

From its sources on the western sides of Targo-gangri and the Shuru-Range to the region of Shildong, this old branch of the Upper Indus has been some 550 km. in length. The Soma-tsangpo which now is 147 km. in length, was during the moist period only 127 km.; the Buptsang-tsangpo, on the other hand, which now is 150 km. in length, was then 195 km., and the Sumdang-tsangpo, now 87 km., was then about 120 km. in length.

Directing now our attention to the eastern half of the great depression at the northern base of the Transhimalaya, we meet exactly the same hydrographical changes as in the western half. The rivers and lakes we now find there are only the fragments and remnants that remain of a considerable river system that has been destroyed by desiccation and differential movements of the surface.



DANGRA-YUM-TSO HARDLY VISIBLE TO THE N 22° W FROM A
HILL SITUATED 4 km NORTH OF CAMP 150.

The first lake in this series is Dangra-yum-tso with an altitude of only 4646 m. But well-developed beach-lines were clearly visible along the sides of the Targo valley and in its tributary valleys. The highest I observed was 90 m. above the present lake, provided the altitude of 4646 m. is correct. The Shuru-tso, 4725 m. high, was surrounded by old beach-lines some 30 m. above the present lake. The water-parting between the two lakes is at 4763 m. The Dangra-yum-tso would thus have to rise 117 m. or slightly more to be in connection with the Shuru-tso, as it no doubt was during the wet period. At that epoch the joined lake may easily have been 200 or 300 m. higher than now, an assumption that does not seem too audacious if we remember that I measured old beach-lines at 133 m. above the present Lakor-tso.¹

The joined lake being thus filled by the Targo-tsangpo, the overflowing water had to escape somewhere, probably to the east, to Ngangtse-tso, which is now situated at an altitude of 4694 m., and to Marchar-tso which is at about the same height, and which at a very recent period, perhaps only a century ago, formed one lake with Ngangtse-tso. The water may thence have escaped somewhere in the region Jhiakta where NAIN SING has an altitude of 4651 m., to Chikut-tso (4502+?), Kyaring-tso (4502, probably too low), Mokieu-tso, Bul-tso, Ring-tso, Tengri-nor, 4630 m., Bum-tso, 4580 m., Bul-tso, 4430 m., and finally to Nak-chu, 4445 m., the uppermost course of the Salwen.

The source branch of this old river must have been the Targo-tsangpo which, from Chang-la-Pod-la to its mouth in the Dangra-yum-tso, is 135 km. in length. From the lake to the Nak-chu we have to add 600 km., so that the old river would have been some 735 km. in length. Tagrak-tsangpo, 110 km. in length, was its first Transhimalayan tributary. As to the others, discovered by Nain-Sing, Bara-tsangpo and Dumphu- or Ota-tsangpo (affluents of Kyaring-tso), and Thama-tsangpo (affluent of Mokieu-tso), they are known only where the Pundit crossed them, but it seems very probable that they have their sources on the Pabla Range, the same range from which the Targo-tsangpo and Tagrak-tsangpo take their origin. On Nain Sing's map their direction is nearly straight from south to north. The Targo and Tagrak, on the other hand, flow from S.E. to N.W. just as the Soma, the Buptsang and the Sumdang. One therefore feels tempted also to join the Tagrak and the Targo with the western river system. But the altitudes as they are now, and the configuration and arrangement of the mountains around the Dangra-yum-tso, make it more probable that the water-parting range between the two old rivers has been situated on the western side of the last mentioned lake.

The next great latitudinal valley to the south is that which follows the southern base of the Transhimalaya and separates that system from the water-parting range

¹ Scientific Results, Vol. IV, p. 164—171, with diagrams.

of the Great Himalaya. A comparison between this valley and the two already considered is difficult on account of the difference in the stages of development reached by the three great valleys. The northernmost has reached farthest in maturity, as its old river all the way from Selling-tso to the neighbourhood of Tso-ngombo is dead and buried under subaerial and sedimentary deposits, and only its uppermost course from Tang-la to Selling-tso is still alive.

In the second valley to the south, the Tengri-nor—Nganglaring-tso depression, the upper courses of the rivers flowing to the west and east are still in function, *viz.* the Soma-tsangpo or possibly a yet unknown river from the Targo-gangri to the eastern part of Teri-nam-tso, and the Targo-tsangpo. But still there is more hydrographical life and a greater abundance of water in this second valley. The lakes are more numerous and generally larger than those in the first valley, where only Selling-tso exceeds in size all lakes except Tengri-nor; and all the larger tributaries of the two old main rivers are still in function, though the volume of water they now bring down from the heights of the Transhimalaya is not sufficient to give rise to any great rivers with an outflow to the ocean.

The third great valley, the one of the Upper Brahmaputra or Tsangpo, has still a drainage that is strong enough to flow the whole year round and to reach the ocean. In these relations we get a very clear illustration of the distribution of the precipitation which is carried by the south-west monsoon towards the world of high mountains situated to the north of India. By far the greatest portion of the moisture is caught by the southernmost and highest mountains, the Himalayan ranges. But a considerable number of wet clouds find their way across the Himalaya and deliver to the northern sides of the water-parting Himalaya and the southern sides of the Transhimalaya, a sufficient quantity of precipitation to give rise to the river Tsangpo. Even on the northern side of the Transhimalaya the precipitation is abundant enough to feed such rivers as the Buptsang-tsangpo, Targo-tsangpo and others. Having crossed the Himalaya and Transhimalaya, the monsoon winds arrive comparatively dry at the mountain ranges bordering the Panggong—Selling-tso valley, which therefore has only small lakes and rivers, the greatest being the Tsanger-shar, the Bogtsang-tsangpo and the Yagyü-rapga. The Selling-tso and its principal feeder, the Sachu-tsangpo, occupy an exceptional position as they derive their water from the gigantic Tang-la Ranges which probably receive precipitation not only from the south-west monsoon, but also from other prevailing winds. Further, the same condition as in the south, *viz.* that the precipitation decreases towards the interior of Tibet, also obtains in the east. From whatever quarter the winds come they have already got rid of the greatest portion of their moisture on the high peripheric mountain ranges surrounding the interior plateau-land as ramparts.

The difficulty in comparing the three latitudinal valleys becomes most evident when we begin to deal with the absolute altitudes. In the northern valley we found a fall of hardly 300 m. from Selling-tso to Panggong-tso, a distance of 930 km.; in the second valley the fall to the west and east from the meridional range of Targo-gangri is extremely slow. In both cases we meet the great evenness that is characteristic of a plateau-land. In the Tsangpo valley we find a continuous fall which, though very slow in itself, is considerable when compared with that of the two northern valleys. It is therefore inadequate to talk of a mean altitude of this valley, which east of Shigatse gradually assumes more and more of the wild morphology of the peripheric regions. In the following examination I have entered some of my altitudes along the Tsangpo from Changtang, opposite Shigatse, to the source where the Kubi-tsangpo comes out from below the glacier snout. The five first altitudes are from the lowest part of the course, the five next from the midst and the five last from the uppermost part of the course.¹

Above Changtang	3815 m.
Changtang	3820 »
Between Shigatse and Sadung	3850 »
Between Rungma and Sta-nakpu	3891 »
Between Ye and Rungma	3908 »
Between Ye and Pusum	4019 »
Confluence of Dok-chu and Tsangpo	4013 »
Confluence of Chaktak-ts. and Tsangpo	4524 »
Confluence of Tsachu-ts. and Tsangpo	4565 »
Camp CLXXXVIII	4583 »
Between Camp CXCI and Camp CXCII	4612 »
Camp CXCI	4608 »
Chärok	4657 »
Shamsang	4697 »
Source	4864 »

The mean altitude thus is 4295 m., or 169 m. lower than the Selling-tso—Panggong-tso depression and 397 m. below the Nganglaring-tso—Tengri-nor depression. Taking the highest portion of the Tsangpo valley from the source to Camp CXCII we get a mean altitude of 4689 m., which is nearly exactly the same as that of the Nganglaring—Tengri-nor depression (4692 m.). This portion of the

¹ There cannot be any appreciable difference between the three first altitudes, as they are taken very near one another, and it would give a better result to take the mean of them. But they are founded on direct observation, and they are needed here as a counter-balance to the five from the middle and the five from the uppermost part.

uppermost Tsangpo valley is no less than 225 m. higher than the corresponding part of the Selling-tso—Panggong-tso depression.

On p. 537 of this volume the mean altitudes of the passes of the three great mountain systems and the mean altitudes of the two depressions between them, are put together. Examining now the difference of altitude between the Tsangpo from its source to Shigatse, and the mean altitude of the great water-parting passes of the Transhimalaya, we get for the five last stations (from the source to Camp CXCII) 856 m.; for the five middle stations (from Camp CXCII to a point between Ye and Pusum) 1204 m.; and for the five stations near and above Shigatse, 1688 m.¹ The difference in altitude thus regularly increases to the east, and continues of course to do so also east of Shigatse. The same course of development would have taken place in the case of the two northern depressions and their rivers if the climate had remained moist and if the old rivers had been allowed to erode their valleys without interruption. No subaerial deposits or solid material of any kind would then have been allowed to remain in the valleys, which would have presented the same sculpture and alpine morphology as the Tsangpo valley near Shigatse, though certainly not on the same magnificent scale, for the precipitation must always have been less abundant in the interior than at the margins of the Tibetan highland.

It would be a great mistake to believe that the same enormous lapse of time that has been necessary for the Tsangpo to cut down its valley to a depth of 800, 1200, 1600 and more meters below the Transhimalayan passes was necessary for the transformation of the Selling-tso — Panggong-tso valley into a series of plateaux through filling up the old valley with subaerial and sedimentary matter. And it would also be wrong to suppose that the deposits of the plateau basins could anywhere have reached a thickness corresponding to the depth of the Tsangpo valley. For

¹ An examination of the mean altitude of the passes of the Great Himalaya would take us too far. The following passes are mentioned by Burrard in his Sketch, p. 84, though not all of them are situated on the axis of the great range: Tipta (15,600 feet), Rohtang (13,000), Hamta (14,000), Buran-ghati (15,121), Shutul (15,555), Kamri (13,250), Burzil (13,500), Manirang (18,600), Baralacha (16,047), Thanglang (18,460), Pangula (20,000), Koru (16,900), Naku (18,186), Donkia (18,100), Tang (15,200) and Zoji (11,300). The distribution of these passes along the range is so irregular that they can hardly be said to be representative for the Great Himalaya. However, the average altitude is 15,800 feet or 4817 m., which is anyhow 728 m. less than the 5545 m. of the Transhimalaya passes. Remembering that the altitudes of the high peaks on the Himalaya are up to 1700 m. higher than the high peaks of the Transhimalaya, the figures give us an idea of the enormous differences in the reliefs of the two systems.

On the Zaskar Range, which is the water-parting between the Kumaun Himalaya and Tibet, Burrard mentions the following passes: Lipu Lekh (16,750 feet), Manghang, Lankpya and Dharma (about 18,000), Untadhura (17,500), Kingri-Bingri (18,300), Balchha (17,500), Shalshal (16,200), Silikank (18,000), Niti (16,500), and the Mana Pass (18,000). The average altitude of these passes is 17,532 feet or 5345 m., exactly 200 m. lower than the average of the Transhimalayan water-parting passes.

Finally Burrard enumerates the following passes on the Ladak Range which is the water-parting between the Tsangpo and India: Harpo (16,785 feet), Burgi (15,697), Lasirmou (16,900), Khardung (17,600), Kay (18,250), Medosi (17,700), Boga (19,200), Ayi (18,700), South of Rakas-tal two passes with 17,100 and 18,200 feet, Photu (15,080), No (16,600), Sheru (17,600), and Kara (17,900). The average is here 17,379 feet or 5298 m., 247 m. less than the average of the Transhimalayan water-parting passes.

the orogenetic origin of the latter valley dates from the Eocene period, if it is not still older, though its modelling into a regularly falling deep-cut valley is the work of the erosive power of running water, whereas the transformation of the Selling-tso—Panggong-tso valley belongs to a very recent time and has been, geologically speaking, of very short duration. It is probable that the differential movements of the surface in connection with the mountain building process during the whole Tertiary epoch and later, have had their maximum in the region of the greatest folds, *i. e.* the Himalaya and Transhimalaya. But these movements have been so slow that they have always been counter-balanced by the speed with which the Tsangpo has been able to cut down its valley. In the northern depressions the rivers finally reached a stage where their erosive power was not strong enough to overcome the regular rising of the ground, and later on the desiccation of the climate did the rest.

If in the future the climatic changes continue in the direction of increasing aridity, the Tsangpo will sooner or later meet the same fate as the other dead rivers of Tibet. It is easy and instructive to imagine what would happen if a rising of the surface somewhere east of Shigatse under such conditions gradually dammed up the Tsangpo valley. Because of the gradually decreasing quantity of water in the river, the latter would not be strong enough to cut through the threshold. A long and narrow lake of the same type as Panggong-tso would be formed in the valley. For some time it would send a small outlet across the threshold. But the increasing aridity and evaporation from the lake would finally cut off the latter completely. Above the lake the dwindling Tsangpo by other local movements of the surface would be cut into several pieces, everyone of them feeding a salt lake. And then the filling and levelling activity would begin, the transformation of a hitherto peripheral country to a plateau-land. As it is now, the Tsangpo valley is swept clean by the river. But after the entrance of a period of aridity as described above, all the solid material would remain in the valley. The screes of detritus at the foot of every mountain would grow, and even the finest particles, the products of denudation and weathering, would be brought by occasional rains to the bottom of the basins. At the mouth of every tributary valley the talus fans would accumulate undisturbed. The sand dunes which now at some places in the valley are formed by the west wind, would no longer be washed away by the highwater of a river. In the uppermost part of the depression where we found the relative altitude of the Transhimalayan passes only 856 m. above the valley, the process of filling would proceed at a slower rate than in the east, between Ye and Shigatse, where the difference in altitude between valley and passes was 1688 m., for in the latter case the denudation would have much more solid material to destroy and accumulate in the valley, a fact which explains the high degree of evenness characterising the great valleys of the interior of Tibet. The filling up of the valley to the same degree as now existing on the

plateau-land would only be a question of time. A bed of deposits in the region of Ye being some 500 m. in thickness would reach even as high as La-rok, and a rather broad plain would expand here between the Transhimalaya and Himalaya.

It is an interesting fact that along the uppermost courses of all the three great rivers, Indus, Satlej and Tsangpo-Brahmaputra, there is a very evident tendency to plateau-formation. From Shamsang and down to Tradum there is a series of flat plains in the Tsangpo valley, and such is also the case along the left Indus branch below Gartok and a long way down the joined Indus. This formation of plains between the parallel ranges has only been possible during an arid period. During the same arid period the enormous deposits in the originally narrow valley of the upper Satlej were also formed. Below these plateau-shaped regions all three rivers cut their beds deeply down into wild narrow valleys. This took place as soon as the volume of water grew to a great quantity and the slope became steep. The uppermost Satlej, however, shows in the plateau-shaped portion of its valley a character quite different from either the uppermost Indus or the uppermost Tsangpo. For it has cut down its bed through the enormous deposits of the arid time, and the tributaries have had to follow at the same speed of mighty erosion. The upper Indus and Tsangpo, on the other hand, have not been able to cut down their beds through the deposits in their valleys. Both these rivers flow in very shallow beds. The cause seems to be twofold. The region where the Satlej cuts through the old deposits is much more exposed to the monsoon rains than the similar region of the two other rivers, and the Satlej therefore here is several times mightier than the uppermost Indus and Tsangpo. In the case of the Satlej the slope is also much steeper, which immensely increases the erosive power. From the confluence of the Singi-kamba and Gartang (4254 m.) and down to Dungkang (4186 m.), the Indus valley has a fall of only 68 m. in 92 km., or as 1:1353. From Shamsang (4697 m.) to Camp CLXXXVIII (4583 m.) the Tsangpo falls 114 m. in 96 km., or as 1:842. But the Satlej from Chunglung-gompa (4239 m.) to Totling (3700 m.) falls no less than 539 m. in 90 km., or as 1:167. Its slope is therefore eight times as steep as that of the uppermost Indus, and five times as steep as that of the uppermost Tsangpo. The erosive power of the Satlej is therefore enormous, if compared with that of the two other rivers.

Comparing finally the valleys falling to the north from the great water-parting of the Transhimalaya, with those falling to the south, we find a striking difference in their morphology, to which I have already directed the reader's attention in the latter half of Vol. III when describing my eight crossings of the Transhimalaya. Here it will be sufficient to state the fact that the valleys going to the lake basins in the great latitudinal depression have a much slower fall than the southern ones, and that the steepness of the latter increases from west to east, which is quite natural on account of the gradual fall of the Tsangpo. The following table shows

the relations on seven lines across the Transhimalaya. The two first, however, do not belong to the Tsangpo. In all cases the slope is steeper on the southern side than on the northern. The difference of height between the northern and southern endpoints increases towards the east; only the fourth line seems to present an exception, which, no doubt, is due to the fact that Ushü is not situated on the river, but some 60 or 70 m. above it.

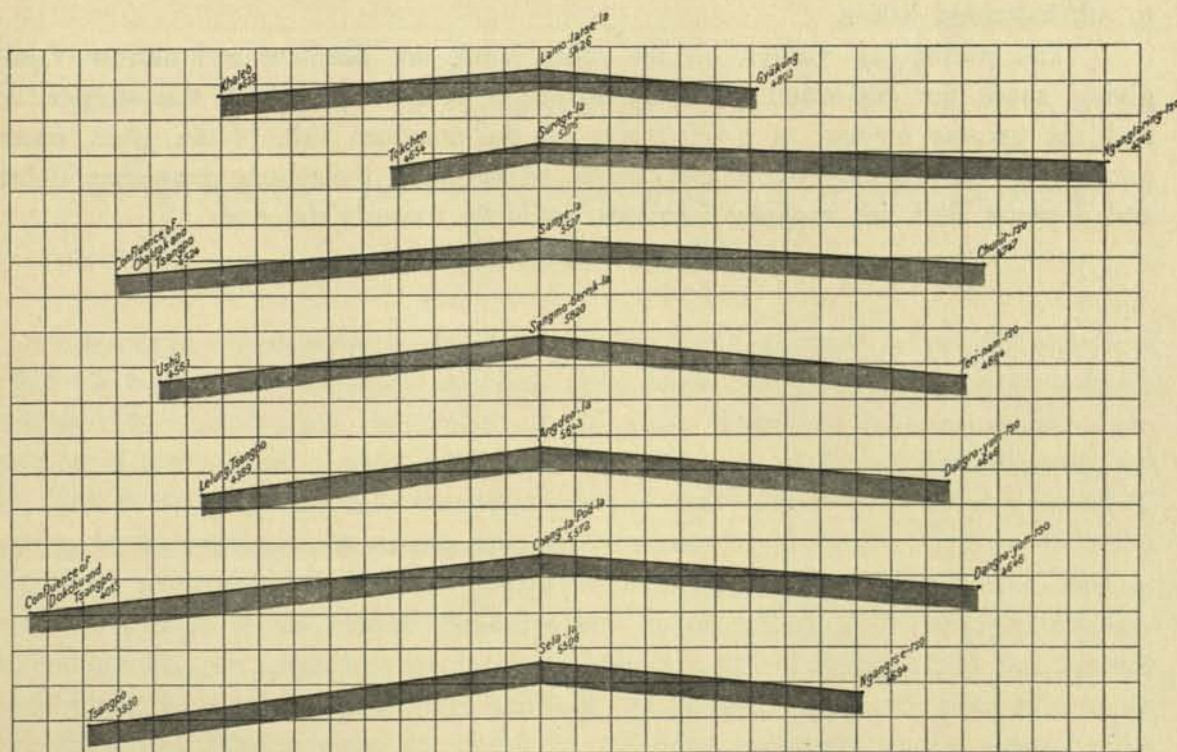


Table of my routes across the Transhimalaya.

Northern endpoint	Gyäkung (C. 241)	Nganglaring- tso	Chunit-tso	Teri-nam- tso	Dangra- yum-tso	Dangra- yum-tso	Ngangtse- tso
Height in meters	4802	4746	4747	4684	4646	4646	4694
Water-parting pass	Lamo-latse-la	Surnge-la	Samye-la	Sangmo- bertik-la	Angden-la	Chang-la- Pod-la	Sela-la
Height in meters	5426	5276	5527	5820	5643	5572	5506
Difference in height	624	530	780	1136	997	926	812
Distance in km.	75,7	160,6	125,7	121,2	116,0	125,0	92,3
Gradient of slope	1 : 121	1 : 303	1 : 161	1 : 107	1 : 116	1 : 135	1 : 114
Southern endpoint	Khaleb	Tokchen	Confluence of Chaktak and Tsangpo	Ushü	Le-lung (Tsangpo; Ryder)	Confluence of Dokchu and Tsangpo	Tsangpo
Height in meters	4629	4654	4524	4563	4389	4013	3930
Difference in height	797	622	1003	1257	1254	1559	1576
Distance in km.	90,9	42,4	120,0	108,1	96,0	145,0	127,0
Gradient of slope	1 : 114	1 : 68	1 : 119	1 : 86	1 : 77	1 : 93	1 : 81
Difference of height between endpoints	173	92	223	121	275	633	764

The northgoing valleys are broad and open and bounded by relatively moderate mountains. They are to a great extent filled with deposits of shingle and gravel, and carry as a rule the characteristic features of plateau-valleys. In this respect they resemble the uppermost portions of the valleys of the Indus and the Tsangpo, though these two rivers flow to the ocean, whereas the northern Transhimalayan rivers go to self-contained basins.

The southgoing valleys, on the other hand, are deep-cut and narrow, rarely giving space for deposition of solid material. In consequence of the steeper fall and the greater amount of precipitation on the southern side of the great water-parting, the southgoing rivers are capable of sweeping their beds clear from debris and deposits, and this capacity increases gradually towards the east.

CHAPTER LX.

LATITUDINAL DEPRESSIONS OF NORTHERN AND CENTRAL TIBET.

We have now examined and compared the three southern latitudinal valleys of Tibet so far as their absolute altitudes, their lakes and rivers, and their probable historical development are concerned. If the white patches of *terra incognita* of the interior of the Tibetan plateau-land were not still as extensive and numerous as they are, and if our geographical knowledge were not so limited, the best plan would, of course, be to continue our examination step by step to the north, starting from the deep and well-marked latitudinal valley of the Selling-tso—Panggong-tso. But at our first attempt to find out the situation and the stretching of the next great valley we would feel our steps lost on too unreliable ground. Leaving alone the western parts which so carefully have been explored by DEASY, RAWLING and others, we find innermost Tibet crossed by only the following travellers' routes (taking them from west to east: HEDIN, BOWER, HEDIN, DE RHINS, LITTLEDAL, HEDIN, HEDIN, BONVALOT, HEDIN, ROCKHILL, and, in the far east outside of the plateau-land, A—K— and PRSHEVALSKIY; the latter on several lines. The journeys still farther east in the Tibetan-Chinese borderland, such as POTANIN's, KOSLOFF's and many others, do not belong to the little-known regions of our examination.

The routes of all the travellers just mentioned are chiefly meridional and run from north to south, all being attempts to penetrate into the nearly hermetically closed provinces of Southern Tibet. In consequence of this distribution of the routes, it proves to be extremely difficult to bring the different travellers' discoveries of ranges and lake depressions into harmony and correspondence with one another.

On the other hand, this difficulty completely disappears if we turn our attention to travellers whose itineraries proceed parallel with the latitudes. In a land of folds, as Tibet, where the folds with few exceptions stretch from west to east, it is naturally enough much easier to travel in the latitudinal valleys between them than to travel along the meridians crossing innumerable ranges and crests. In the

northern regions of Tibet we have two such itineraries, *viz.* those of WELLBY-MALCOLM, and mine, both from 1896. That the latitudinal stretching of the folds prevailed in northernmost Tibet, *i. e.* north of 37° North. Lat., has been proved chiefly by the Russian expeditions under PRSHEVALSKIY, PIEVTSOFF and ROBOROVSKIY. Wellby's and my own expeditions prove that the same orographical law also holds good for the belt of land situated between 35 and 36° North. Lat. Between $32\frac{1}{2}$ and 35° extend the uncertain plateau regions, although we may feel pretty well convinced that the same folding law even here is *en vogue*, as is indicated by certain sections of BOWER's, ROCKHILL's and my routes, as well as by the many ranges which have a latitudinal stretching and which must be crossed in passes. Regarding Southern Tibet, south of $32\frac{1}{2}^{\circ}$ the great folds are built up latitudinally, or rather parallel to the general stretching of the Himalayan system.

Considering the self-contained basins of Northern Tibet we found the mean altitude of 12 Kwen-lun lakes to be 4891 m., and 6 lakes in Wellby's depression to be 4956 m. (p. 499—500 above). Whilst Wellby and Malcolm travelled through the whole of Tibet from Lanak-la to the uppermost Chumar or Namchutu-ulan-muren, I only explored the eastern half of the latitudinal valley which is the neighbour of Wellby's to the north.

In my valley I passed only 20 lakes; to the south and S. E. from the eastern end of my lake No. XX I saw two more at no great distance. On their journey, in 1886, CAREY and DALGLEISH passed along these two lakes and a third one situated just east of them, after which they crossed a river Chumarin-dsun-kuba which again was crossed by ROCKHILL, in 1892. The latter, which is a left tributary to the Chumar, certainly not very long ago drained off at least the whole eastern part of my valley at the southern base of Arka-tagh. But that considerable time has elapsed since the lake No. XX was cut off from the oceanic drainage is evident from the strong salinity of this lake.

In the following table I have put together the absolute altitudes of the lakes in my valley of 1896. The heights of Lake XIII and Lake XII are approximate, as the route passed at some distance from their shores; DUTREUIL DE RHINS' Lac de l'Antilope is added, whereas his Lac de Corbeaux which belongs to the same valley, was left too far from his route west of it, as well as from my route 1896 east of it, to have its altitude determined.

Lake XX	4616 m.	Lake XIII.	5050 m.
Lake XIX	4810 »	Lake XII	5090 »
Lake XVIII.	4920 »	Lake IX	4946 »
Lake XVI	4932 »	Lake IV	4968 »
Lake XV	4896 »	Lake II	4900 »
Lake XIV	5078 »	Lake de l'Antilope .	4920 »

From east to west the first four of these lakes show an increasing altitude. In the region of Lakes XIV, XIII and XII, a rise of ground seems to have taken place. The difference in altitude between the lowest and the highest lake in the series is no less than 474 m. The altitudes of the two easternmost lakes directly indicate the affinity of this valley for the upper feeders of the Yang-tse River. The relative altitudes of the thresholds situated between the lakes is very small, *viz.* between Lake XIX and Lake XVIII, 5085 m., between Lake XVIII and Lake XVI, 5099 m., between Lake XVI and Lake XV, 5116, thus increasing in altitude from east to west, whereas the threshold between Lake IV and Lake II is only 5026 m. From Lake XVIII and westwards the valley may be said to be very level, 220 m. being the greatest difference in altitude between a lake and a threshold.

The valley just described is a very regular and typical depression between two gigantic folds, the Arka-tagh and the Koko-shili. Lac de Corbeaux and Lac de l'Antilope of de Rhins clearly indicate its western prolongation. Then follows an extensive area of *terra incognita*. It may be regarded as pretty certain—by conclusions of analogy—that the latitudinal valley continues through the whole of this region, is nearly parallel with the valley of Wellby, and is in uninterrupted connection with the valley of the Antelope-plain, with the itineraries of WELLBY, DEASY, RAWLING and myself, and still farther west with the latitudinal valley of Yeshil-köl, Lighten Lake, the Aksai-chin Lake and the Salt marsh of 4663 m. The lakes of this enormous valley are fed from the snow fields and glaciers on the very high and mighty range of Kwen-lun—Arka-tagh. It is surprising that such considerable rivers as the Yurun-kash, Keriya-darya and Cherchen-darya take their origin from the northern side of this range which faces the desert, whereas only small brooks flow to the lakes along its southern side which ought to catch the greatest amount of the moisture brought hither by the southern winds.

It is of course impossible to tell, with any degree of certainty, how the drainage of this great latitudinal valley was arranged at an epoch where the whole of Tibet drained off to the ocean and to the Tarim basin. Very likely, however, the whole eastern part of the valley, from the region of Lac de l'Antilope and including all my lakes of 1896, drained to the Di-chu, King-sha-kyang, and Yang-tse; and the western part, from Yeshil-köl or Lighten Lake, to the Kara-kash. As to the precipitation falling in the yet unknown part of the great valley, it may have found its way out either to the west or the east, or, providing that it possessed the same force as the Kara-kash to break through the Kwen-lun in transverse valleys, — to the Tolan-khoja, Bostan-toghrak or Kara-muran.

An interesting problem which can only be slightly discussed in this connection is the question of the struggle between the rivers and the sand dunes of the Takla-makan Desert during the epoch of abundant precipitation in Tibet. If we consider

the rivers flowing from south to north and belonging to the Tarim system we find that they decrease in volume from west to east. Yarkand-darya is incomparably the greatest. The joined waters of the Kara-kash and Jurun-kash are not sufficient to permit the Khotan-darya to reach the Tarim the whole year round, though it has enough volume to overcome the desert. The next river to the east, the Keriya-darya, is overwhelmed by the sands in the middle of the desert, and the still farther east-flowing rivers, the Tolan-khoja and its neighbours, disappear amongst the dunes not very far from the northern foot of the mountains. The Cherchen-darya, on account of its extended drainage area, is an exception to the rule.

During the moist period all these rivers were much larger than now. The Khotan-darya flowed the whole year round to the Tarim, as also did the Keriya-darya. The small rivers east of the latter joined into one or two main rivers which probably, at least in June and July, reached the Tarim. This abundance of water formed a lake many times larger than the present Lop-nor. Heaps of sand and dust were carried down into the depression, which therefore became as level as I found it in 1901. When the desiccation began the rivers gradually decreased in volume, the sand dunes inundated the basin, the old Buddhist civilisation, the traces of which we have found at several places in Eastern Turkestan, disappeared; the large lake dwindled, and later on only a comparatively small lake remained in the northern part of the Lop Desert with the Chinese colony Lou-lan at its northern shore. Finally this lake dried up and another was formed in the southern part of the desert. If the desiccation continues in the future the Lop-nor will disappear completely and the sand dunes will bury the lower course of the Khotan-darya as they have done long ago with the lower courses of the Kara-muran, Bostan-toghrak, Tolan-khoja and Keriya-darya.

We have (p. 20) found the mean altitude of 6 lakes belonging to the folding trough of Wellby between the Koko-shili and Dungbure systems, to be 4956 m. Taking now all the altitudes entered on Colonel Byström's map in 1:1000,000 (*vide* Atlas) of the same trough, we get for the central part, from the region just west of Lake Markham to the region south of Lac de l'Antilope 4885 m.¹ The mean altitude of the next section which goes to the fresh-water lake of the Chumar river, is 4898 m. Here the number of altitudes is 17, of which three were taken by me at points where I crossed Wellby's route in 1900 and 1901.² Only in the easternmost part of this valley is the fall towards China clear and marked by the Chumar River. It is surprising that the last lake of Wellby, the one through which the

¹ The altitudes are: 5100, 5211, 4714, 4572, and 4730, the last from de Rhins. They are taken both from lakes and other parts of the trough, which is also the case with the next section of Wellby's route.

² The altitudes are from west to east: 4928, 4920, 4804, 4917 (Hedin), 4891 (Hedin), 4962, 4982, 4829, 4766 (Hedin), 4870, 4969, 5090, 4942, 4890, 4860, 4850, 4800 m. Taking the average of all these altitudes we get a mean of 4895 m.

Chumar flows, lies nearly 200 m. higher than my Lake XX which is salt and belongs to the self-contained region of Tibet. However it seems likely that the Yang-tse drainage during the moist epoch reached to the region where now de Rhins' Lac des Roches Rouges and Lac No. 4 are situated. The central part of Wellby's valley has probably drained to the Tarim basin, provided that its rivers were able to pierce the Kwen-lun ranges, while the westernmost portion of the same valley has drained to the Indus.

South of Wellby's route the difficulties begin in the central parts of the great plateau-land where not a single traveller has crossed Tibet from west to east or vice versa. In the far east, outside of the boundary of the self-contained plateau-land, the latitudinal valley of the Mur-usu and its left tributary, the Toktomai-ulan-muren, however, clearly indicate the next great folding trough. Continuing in the western prolongation of this valley we indeed come across a series of seven lakes discovered by different travellers and all of them situated between 34° and $34\frac{1}{2}^{\circ}$ North Lat. In spite of the interruptions of *terra incognita* between some of these lakes, they really seem to mark a continuous folding trough between two mountain systems. These lakes are the following:

Lac Montcalm	4960 m. . . .	Bonvalot
Large Lake	4968 » . . .	Hedin ¹
Place in a valley	4956 » . . .	Littledale
Vallée des Lacs Jumeaux	5121 » . . .	de Rhins
Lake between Camps LI and LII, approxim.	5000 » . . .	Hedin
Salt Lake	4880 » . . .	Rawling
To Huping-tso	5030 » . . .	Rawling
Gore-tso	5180 » . . .	Rawling

The mean altitude of the lakes is therefore 5012 m. The Yang-tse drainage of this valley has stretched to about 85 or 86° East Long., whereas the western part of the valley has belonged to the Indus system.

The next folding trough to the south is interesting. It begins in the east in the latitudinal valley running along the northern foot of the Tang-la system and belonging to the drainage of the Yang-tse. Through this valley Rockhill travelled in 1891—92, though it is a pity he has no altitudes on his map. The fold continues westwards along his Keten-gol and over the Chib-chang-tso, to the basin of which Bonvalot has given the unreliable altitude of 5300 m. Then the prolongation of the fold is indicated by the following lakes and valleys:

Salt Lake (Camp XLVI, 1901)	4972 m. . . .	Hedin ²
A valley	4957 » . . .	Hedin

¹ The observation is taken at some distance from the lake which therefore has a lower altitude.

² The names indicate the explorers who are responsible for the altitudes.

A valley	4863 m. . . .	Hedin
Camp near lake	5235 » . . .	Littledale
Lac des Perdrix	4450 » . . .	de Rhins
Pulka-tso	4928 » . . .	Hedin
Lake near Camp 28	5039 » . . .	Bower
Lumbur-ringmo	4633 » . . .	Hedin
Lemchung-tso	4820 » . . .	Hedin
Shemen-tso	4960 » . . .	Hedin
Arport-tso	5298 » . . .	Hedin
Tsaggar-tso	5160 » . . .	Deasy

The mean altitude of this long valley is 4944 m. Its immediate continuation to the west is the Chang-chenmo valley, from which it is separated only by the flat pass of Lanak-la, 5488 m. high (Deasy). A very considerable part of my journey in 1908 goes through the western part of this valley. The source of the river that once flowed through it to the W. N. W. and N. W., probably was situated somewhere in 85° East. Long. The western part of the preceding valley to the north, the one containing amongst other lakes the To Huping-tso and Gore-tso of Rawling, has drained off *via* Aru-tso to the river which once flowed in the basin of the present Shemen-tso. In the far east this valley is situated at a very short distance from the preceding valley, the one of Toktomai-ulan-muren, and is separated from it only by the range of Buka-magnai. The phenomenon of great rivers flowing close to one another without joining, and being separated by high, wild ranges, is very common in the middle course of the Indo-Chinese rivers. But the two valleys dealt with here no doubt joined some distance east of Buka-magnai.

The Chang-chenmo valley which we have now brought into connection with the valley of the Mur-usu tributary north of Tang-la, is a transverse valley straight across a great portion of the Kara-korum system. From a purely tectonic point of view the fold may be traced from Arport-tso still farther north-westwards through the valley I followed in 1908, to the Lake of Aksai-chin and to the upper Kara-kash.

If we compare the great latitudinal valley north of the Tang-la and stretching to the Chang-chenmo, with the Selling-tso—Panggong-tso valley, we will see that they are perfectly parallel with one another and with the Transhimalayan system. In their eastern portions they turn to the E. N. E. and N. E. just as the Nien-chen-tang-la, while in the west they become more and more parallel to the Gartang and the upper Indus. The fact that every one of these great troughs contains a series of depressions, lakes and rivers, proves that the above examination is correct. The most important result of this examination is that it now becomes easier for us to follow the stretching of the great mountain systems of Tibet.

At a time when great rivers flowed through the latitudinal valleys of Tibet, innumerable tributaries joined them from both sides. As the main rivers, the tributaries had also generally a latitudinal stretching. Even now after the enormous geomorphological and climatic changes which have taken place since the moist period we meet nearly every day on a meridional crossing of Tibet a new latitudinal valley. We have dealt with only the principal ones. Even if it would be easy to trace many secondary latitudinal valleys, such a task would serve no useful purpose. I will mention only one greater than the rest. It is situated between $33\frac{1}{2}^{\circ}$ and 34° North. Lat. and seems to have had its sources on the north side of BON-VALOT's Mts. Dupleix and to have joined the river that passed by Aru-tso. Along its course we find from east to west the following lake depressions:

A lake	5138 m. . . .	Little-dale
Lac du sel rouge	4698 » . . .	de Rhins
Near Gomo-tsaka	4843 » . . .	Hedin
Near a lake	4901 » . . .	Bower
Near a lake	5132 » . . .	Bower

The mean altitude of these depressions is 4942 m.

It now only remains to say a few words regarding the folding troughs north of my valley of 1896. They are, of course, innumerable as all over Tibet, and it is sufficient for our purpose to consider only two of them.

Between the mighty system of the Arka-tagh with its more or less detached ramifications towards the north, and the Kalta-alakan, Piazhlik-tagh and the western part of Astin-tagh, there is a folding trough beginning in the east with the Chulak-akkan valley of CAREY and DALGLEISH and continuing westwards across:

Bulak-bashi.	3922 m.	Aikin-otak	4795 m.
Bash-kum-köl	3882 »	A Pass	5108 »
Ayagh-kum-köl	3867 »	Mandarlik in Patkaklik-darya	3511 »

It would be of no use to calculate an average altitude for the whole stretching of this trough, for in the east it goes on without interruption into the Tsaidam Basin, and in the west by Cherchen-darya into the Tarim Basin. The most characteristic part of the trough is that of the two lakes, the mean altitude of which is 3875 m. Nor do the eastern and western flanks of this trough belong to the self-contained regions of Tibet.

The last, and more conspicuous folding-trough, lies altogether outside of the self-contained region. It has Akato-tagh to the north, and Piazhlik-tagh, Kalta-alakan and Chimen-tagh to the south. Its valley is called simply Kakir, and its watercourse is directed to the lake Ghaz-nor or Chimen-köl at an altitude of 2837 m. The altitudes of these two troughs therefore indicate two steps downwards to the plains of Gobi.

Putting together the nine principal folding-troughs of the Tibetan plateau-land we get the following table:

Kum-köl valley	3875	(I)
My valley of 1896	4927	(II)
Wellby's valley	4895	(III)
The valley of Lake Montcalm—Gore-tso	5012	(IV)
The valley of Lake du sel rouge—Gomo-tsaka	4942	(V)
The valley of Lake Camp XLVI—Tsaggar-tso	4944	(VI)
The valley of Selling-tso—Panggong-tso	4464	(VII)
The valley of Tengri-nor—Nganglaring-tso	4702	(VIII)
The valley of the Tsangpo from source to Shigatse	4295	(IX)

Speaking of the Tibetan plateau-land proper the Kum-köl valley cannot be considered, as it occupies an exceptional position north of the Arka-tagh, and the Tsangpo valley does not at all belong to the plateau-land. The table shows a difference of 548 m. between the highest and the lowest valley. The average altitude of all the valleys is 4841 m., or 31 m. more than the summit of Mont Blanc. This gives a clear idea of the enormous altitude of the great plateau, remembering that we are dealing here with the depressions only, *i. e.* the lowest points existing in the interior of Tibet. Here again the valley of Selling-tso—Panggong-tso is especially conspicuous, being nearly 400 m. lower than the average. The table also shows that the northern, most desolate and absolutely uninhabited half of interior Tibet, in which the valleys II, III, IV, V and VI are situated, is higher than the southern half; the average altitude of the five valleys being 4944 m., whereas the average altitude of the southern valleys, VII and VIII, is 4583 m., or 361 m. less.

The average height of 15,000 feet or 4576 m. given by Sir SIDNEY BURRARD¹ is therefore too low. For even if the Kum-köl trough is entered in the calculation, we get an average height of 4720 m. or 144 m. more.² But in this calculation we have only made use of the lowest points, the depressions of the plateau-land, and not of the convex protuberances between them, which have to be considered when we talk of an average height of the whole plateau. To this calculation we shall have to return in the next chapter where we also shall have to consider the mean altitudes of the mountain systems of Northern and Central Tibet.

¹ A Sketch of the Geography and Geology etc. Part II, p. 64.

² Burrard, however, also reckons the Tsaidam as part of the Tibetan plateau-land.

CHAPTER LXI.

THE TRANSHIMALAYAN RANGES.

Regarding the principal arrangement of the mountain ranges and systems of Tibet we may with the greatest confidence accept the views of Sir S. G. BURRARD as they appear on his frontispiece map¹ — so far as the western and southern portions of the highlands and the gigantic ramparts are concerned, the Pamirs and the Himalaya. His conclusions, founded upon the most reliable material in existence, must both in the west and the south be used as fundamental lines in our attempts to follow the alignments of the systems in the little known or even unknown parts of the interior of Tibet, and in our speculations regarding the connection of the more or less well-known ranges in the west with their continuations and prolongations in the east.

As a series of starting points of great importance I also regard the S. E. ends of the three Kara-korum Ranges as the latter have been described by Dr. ARTHUR NEVE. (Cf. Pl. LXXXVIII below.)

The Ladak Range of Burrard we may take as fixed. Regarding his Kailas Range my results in very essential points disagree with his, especially in the whole central section of this system. The first step we have to take is therefore to try and fix the situation of the Kailas Range. It should be said at once that this name is unsuitable for the whole system. The Kailas is only a point on a very long line, whereas Transhimalaya is a name indicating a labyrinth of ranges situated on the other side of, or beyond, the Himalaya. As soon as we are able to fix the situation of the Transhimalaya, we have a framework or starting line to the south and west, from which we may continue our attempts to conquer the next great fold to the north of it, and so forth the whole way up to the Kwen-lun. To this problem also belongs the interesting question about the connection of the Tang-la with one of the Kara-korum Ranges.

¹ A Sketch of Geography and Geology of the Himalayan Mountains and Tibet Calcutta 1907. — The map is reproduced in Vol. III, p. 218 of the present work.

THE LADAK RANGE.

Following GODWIN-AUSTEN, BURRARD has accepted this name for the whole range running from Baltistan to Assam, where it forms the water-parting of the Brahmaputra of Tibet and the Brahmaputra of Assam. It runs parallel to the Great Himalaya. In its western section the Kubi-gangri with its several peaks, the Ganglung-gangri and the Gurla-mandata are situated on it. North-west of Gurla-mandata follows a gap of some 100 km. where the continuity of the range is not yet settled. It seems, however, to run on the southern and western shore of Rakas-tal and then between the upper Satlej and its left tributary, the Lang-jen-tsangpo, which probably pierces it near Gerik-jung (on the Satlej). From here it continues N. W. on the left or S. W. side of the Gartang and Indus. Where the Hanle River enters from the left the range is broken through by the Indus in a transverse valley. From this point the Indus therefore flows along the S. W. flank of the Ladak Range. For a very long distance the range is situated between the Indus and the Shayok. Near the junction the Indus again crosses the range.¹ Burrard shows the extraordinary way in which the Indus and the Ladak Range are intertwined, and correctly supposes »that the Ladak Range has grown, since the Indus began to flow».

THE KAILAS RANGE.

The next range, the one which is the nearest neighbour to the N. E. of the Ladak Range, is what BURRARD calls the Kailas Range, and NEVE suggests should be called the Saltoro Range in its westernmost section. From a geotectonic point of view it forms the N. W. continuation of the Transhimalaya.

After its sharp bend to the N. W. near the village of Shayok, the Shayok River flows along the S. W. flank of the Kailas Range, the latter being pierced in transverse valleys both by the Nubra and the meridional course of the upper Shayok River where both rivers therefore flow parallel to one another. The Chang-chenmo River joins the Shayok just above the point where the Shayok pierces the range, which then is situated N. E. of and parallel with the westernmost part of the Panggong-tso. Near the eastern end of Panggong-tso proper, *i. e.* west of Tso-ngombo, the range has been pierced in a transverse valley by the river which once flowed westward through the Panggong valley, and were we now find the lakes. I have shown above that this transverse valley is exactly parallel to the transverse valley of the Indus above the mouth of the Hanle River.

¹ Cf. also NEVE's diagram here, Pl. LXXI, and his orography, Pl. LXXXVIII.

South of the Panggong the Sajum (6103 m.) is situated on the Kailas Range. Burrard regards the alignment from Sajum to the junction of the Nubra and Shayok as uncertain. The stretching I have now sketched seems, however, plausible, though a smaller fold runs along the S.W. shore of the Panggong-tso and along a part of the Shayok below its sharp bend; this fold is pierced by the Tanksi-Drugub River through the valley of which the Panggong river from Tibet once escaped to the Shayok.

From the Sajum peak the Kailas Range continues S. E. bordering the valleys of the Indus and Gartang, and on $32\frac{1}{2}^{\circ}$ North. Lat. it is pierced in a transverse valley by the Singi-kamba or Uppermost Indus. Then it runs between the Gartang and Lang-chu. The Jukti-hloma-la (5825 m.) is situated on it. In Singtod its situation is unknown, but it certainly forms the water-parting between the uppermost Singi-kamba and the Satlej along the section of its course from Rakas-tal to Gerik-jung. A series of passes of the same geomorphological importance as the Tseti-lachen-la (5466 m.) and Tseti-la (5628 m.) are situated on its crest. The Kailas (6716 m.) cannot be said to be situated on the Kailas Range, though of course, it belongs to the Kailas system. The Sacred Mount rises on a short parallel range in front of the main range, and of much more pronounced alpine character than the so-called Kailas Range.

So far S. E. as to the flat threshold of Surnge-la (5276 m.), the Kailas Range of Burrard may thus easily be traced. And with full reason it may be called a *range*, even if it here and there has small secondary ranges of the same system at its sides. But from Surnge-la where the N.W.—S. E. direction is smoothly changed into a direction from west to east, the orographical arrangement assumes a quite different character. It is impossible and absurd any longer to talk of a *range* running along the northern side of the Tsangpo-Brahmaputra valley, as has been done by some geographers and mapmakers. Burrard did it also on his frontispiece map, but this was published before I had finished my exploration in the Transhimalaya.

No doubt the Transhimalaya has to be regarded as the same crustal fold as the Kailas Range, and as being in a very intimate geotectonic relation to the latter. But the tangential forces which have pressed the whole Kailas Range, down to Surnge-la, into so beautiful and regular a crustal fold, have, east of the same pass, broken up the earth's crust in a most fantastic way, giving rise to a labyrinth of ranges, which seem to be arranged according to a certain symmetrical system or orographical law, but which also run in all possible directions, from east to west as well as from north to south; from N.W. to S. E. as well as from N. E. to S. W.

I have no objection to the name Kailas Range from the beginning of this system in the west as determined by Burrard, and to the region of Surnge-la or a little farther east. It may seem curious, it is true, to call a range that runs through

Baltistan »the Kailas Range» after a peak situated hundreds of miles away and not even on the very range itself. Dr. NEVE certainly had a feeling of the absurdity of the name and he has therefore proposed the name of Salto Range, so much the more as it is indeed a part of the Kara-korum system. But as the name Kailas Range has some traditional *raison d'être*, and as it has been introduced in the geographical terminology under the strong authority of Burrard, it may remain on the maps. But under no condition beyond Surnge-la! For to pretend that the snow-covered peaks of Lunpo-gangri and Kanchung-gangri or even of the Targo-gangri were parts of the »Kailas Range» would be absurd. Nor has such an absurdity in any way been maintained or defended by Burrard.

I would therefore propose to call the system the Kailas Range from its beginning in the west to Surnge-la, and thence eastwards to its end, the Transhimalaya.

THE TRANSHIMALAYA.

As a short introduction to the following description of the Transhimalaya I will quote a few words which I wrote in the summer of 1905 just before starting upon my last expedition to Tibet:¹

»... it would be labour wasted to attempt to define the ranges in the heart of Central Tibet, and in the country between Nain Singh's route and the valley of the Tsangpo. In fact, the results of any such attempt would have to be constructed to such a great degree upon guesswork that they might with justice be pronounced valueless, or at all events useless for scientific purposes.»

And further:

»In the unknown region of the south, that is to say in the country immediately north of the valley of the Tsangpo, we have reason to suppose the existence of an important mountain-range, one part of which is the Nin-cheng-tang-la on the southern shore of the Tengri-nor; and the same important range we find again also in the west, namely in the Alung-gangri swelling. These two sections would, it is true, not be sufficient to warrant us in positing the existence of a continuous range, but we are also justified in presupposing, almost of necessity, the existence of at least one important water-dividing ridge between Nain Singh's lakes and the Tsangpo. We may further take it that the most north-easterly of the head-feeders of the Indus likewise gathers its waters out of this unknown and mysterious range.»

These words prove how little was in reality known of the country north of the Tsangpo.

¹ Scientific Results, Vol. IV, Stockholm 1907, p. 539 and 545.

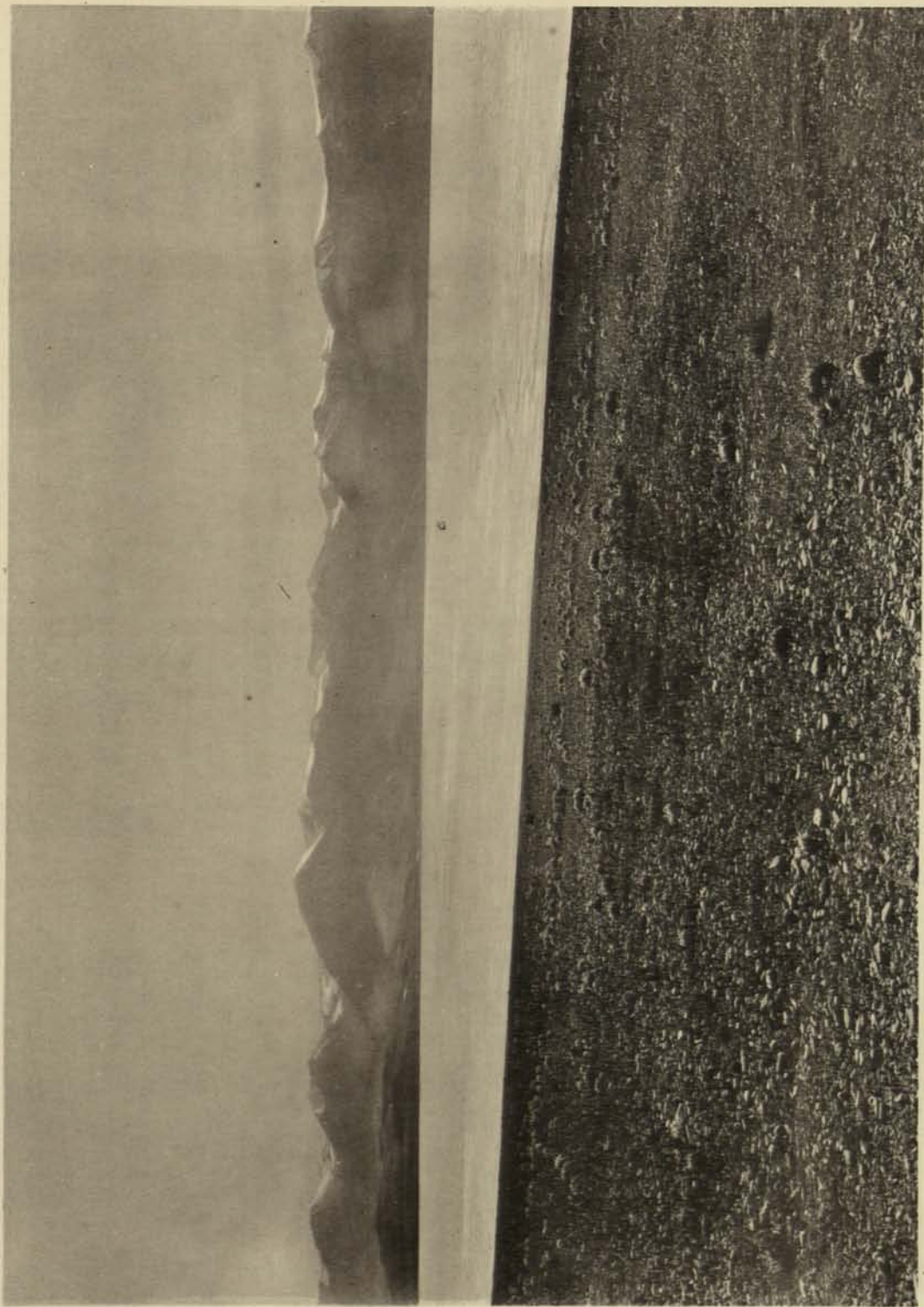


VIEW TO THE SOUTH AND S. E. FROM GYANYAK-LA, DEC. 13, 1906.

THE TANG-YUNG-TSAKA IS SEEN SURROUNDED BY HIGH MOUNTAINS.



THE GANGRI-DO MOUNTAINS WEST OF SHURU-TSO.
LOOKING S 60° W FROM CAMP 151.



GANGRI-DO, THE RANGE ON THE WESTERN SHORE OF SHURU-TSO.
LOOKING N 86° W FROM CAMP 152.

In Vol. III I have already in detail described the Transhimalaya as I saw this system, and in Vol. VI I have added some information regarding its morphology along my routes. It here only remains to add a few words of its different ranges as they will be found on our map in 1:1,000,000, drawn from all existing material by Colonel H. BYSTRÖM. It is obvious that I can talk of the system only so far as I know it by my own experience or from 81° to $88^{\circ} 15'$ East Long. This portion of the system which I have called the Central Transhimalaya — the Kailas Range being the Western, and the Nien-chen-tang-la and its continuation the Eastern Transhimalaya — I subdivide into three regions:

1. From $81^{\circ} 20'$ or the meridional line on which the Kailas, the neck of land between the Rakas-tal and the Manasarovar, and the Gurla-mandata are situated, — to $84^{\circ} 35'$ or the meridional line of Chunit-tso, the plain of Bongba-Kebyang and the middle portion of the valley of the Buptsang-tsangpo.

2. From $84^{\circ} 35'$ to $86^{\circ} 30'$, or the line on which the Tang-yung-tsaka, the Dangra-yum-tso, the lower part of the valley of the Targo-tsangpo, the Shuru-tso and the Amchok-tso are situated.

3. From $86^{\circ} 30'$ eastwards to $88^{\circ} 15'$ or so far as I know the Central Transhimalaya.

The three lines just mentioned are of great interest. They are all three meridional or running at right angles across the prevailing east-west alignment of the system. Their character becomes more pronounced as we proceed from west to east. The geotectonic building of the easternmost line seems therefore easier to explain than that of the westernmost, and the relations on the middle line (Chunit-tso) are clearer than those on the Kailas line, but less clear than those of the Dangra-yum-tso line.

A curious feature common to all three lines is that their depressions occur in connection with the highest mounts of Tibet, which on a small scale is the same phenomenon as the distribution of zones of folding in the immediate vicinity of the oceans.

The mountain systems of Tibet become higher, wilder and more complicated as we proceed from the interior of the plateau-land to the south. This is, in no small degree, due to the denudation of the ranges and the filling up of the valleys in the interior, a process by which the original ranges are hidden by enormous quantities of secondary material. The Transhimalayan system is both broader and higher than the systems north of it, and the Himalaya is in nearly all senses more magnificent than the Transhimalaya. In consequence of the tangential stresses the superficial layers of the crust were compressed and crumpled, and where this process met the resistance of the Indian peninsula the most gigantic folds were built up. The strain continued from north to south, and the next series of earth-waves which rose simultaneously to the north of the Himalaya met the resistance of the growing

ramparts in front of them. Directing our attention only to the area of the earth's crust which is occupied by the Central Transhimalaya, we find that the crust-wrinkles or folds which are the result of the tangential or lateral stresses from the north and the resistance of the regions south of it, have not arranged themselves in the same regular order as, for instance, the Great Himalaya, the Zaskar, Ladak, and Kailas Ranges farther W. N. W., but are bent, turned and pressed together as if they, in some places at least, had been exposed to a torsion resulting from lateral stresses from the west and east as well as from the north. Regarding attentively the map of the area in question (sheet XIV of the map in 1:1,000,000), we easily see that this area is too small for a regular, normal and undisturbed development of crustal folds. If that had been the case we would have found ranges parallel with the main axis of the Himalaya and with the same radius as it.

But instead of this we find in the westernmost portion of the area between the first and second lines a system of at least nine, probably more, smaller ranges overlapping one another, chiefly running from N. W. to S. E. — whilst the Tsangpo valley runs W. N. W. — E. S. E. — but also possessing ranges running meridionally or even, as the northern portions of the Surla and Pedang Ranges, N. N. E. — S. S. W.

The greatest divergence from a normal and regular development of the folds is, however, met with in the central part of Central Transhimalaya, *viz.*, between our second and third lines. From its northern end at the right side of Buptsang-tsangpo in the district of Bongba-Kebyang, the Kanchung-gangri with its continuation, the Gangri-do and Targo-gangri, forms a nearly regular semicircle 320 km. in length. But the distance between the northern endpoints of this semicircle is only 180 km. North of this fold we have the Lapchung Range with its continuation the Shuru Range.¹ It is nearly parallel to the Kanchung-gangri fold, both turning their convexities to the south. Its length is 240 km., and the distance between its northern endpoints only 170 km. It is therefore less sharply curved than the Kanchung-gangri. North of the Lapchung Range I was unable to discern any prevailing directions of the ranges as far as I could see the country.

But north of the Soma-tsangpo there is the Teri-nam Range, about 100 km. in length and with a distance of 92 km. in a straight line between its ends. The bending of the three folds has therefore increased from north to south at the rate of 1,111, 1,412 and 1,777. The Kanchung-gangri curve would have needed more than one and a half times as much space as it has for being folded in a normal way under the influence of the tangential stresses from the north. But the compression from east and west has been so violent that the folds have been distorted

¹ The relations between the Shuru and Gangri-do Ranges are uncertain. It is possible that they are one and the same range, which, however, only in a small degree would interfere with the above calculation.

in a disproportional way, and forced to build themselves up within the limits of too small a space. The outermost of the three ranges, *viz.*, the Kanchung-gangri, has been more exposed to the lateral compression than the two others. To these it has formed a protection. The Lapchung Range has therefore been less compressed, and forms a less pronounced semicircle. The Teri-nam Range, the innermost one, has been protected by the two others and therefore suffered least. Its convexity towards the south is so small that this range may be said to form a normal fold parallel with the great folds in Southern Tibet.

This is not the only disturbance that has taken place in the central portion of Central Transhimalaya. Under the influence of strains caused by the violent compression from the sides, meridional fractures or faults have been produced. A nearly meridional series of faults has caused the chain of depressions existing on about $86^{\circ} 30'$ East Long., forming a feature that indeed may be said to be extremely rare in the morphology of Tibet. From Tang-yung-tsaka to Amchok-tso, a distance of 250 km., there is a strip of the earth's crust which has been let down between more or less parallel faults, thus forming a sunken area, or a rift-valley; what the Germans call a *Grabenversenkung*. The Angden-la (5643 m.) which here is on the water-parting of the Transhimalayan system, is the only point in this rift-valley that still stands up, and that has, together with the strip of land just north of it, been able to resist the general sinking of the rest. On my route from Bogtsang-tsangpo to Ngangtse-tso I could see the Tang-yung-tsaka like a pool in a deep hole, nearly everywhere, except to the S. S. W., surrounded by high mountains (cf. the sketch-map). At a greater distance to the S. S. W. one could clearly see the rift-valley which is filled by the Dangra-yum-tso, though the lake itself was not visible; only the surrounding mountains, which, especially to the N. E. of the lake, were of considerable height. Then the meridional depression makes a turn to the S. S. E., and here contains the lower course of the Targo-tsangpo. Near my Camp 150 the rift-valley continues S. W. as a very flat and open valley joining the depression of Shuru-tso. From the southern shore of this lake to a little south of Angden-la the crust has not in the same degree as elsewhere taken part in the sinking process. But south of Angden-la the depression continues in the valley Amchok-tang, Amchok-tso, and the valley of the outlet from this lake to the Raga-tsangpo. Even south of this river the Chotrang-tso of Ryder is situated on the same line of sunken ground.

Our second line, the one of $84^{\circ} 35'$ East Long., may also be said to be a rift-valley, though less clearly marked than the third line, the one of Dangra-yum-tso just dealt with. It begins to make its appearance at nearly the same latitude as the third line, *viz.*, at $31^{\circ} 30'$ North Lat., in the district of Bongba-changma. Here there are in the meridional valley points of no greater altitude than 4628 and 4612 m. Then follow the Lake Chunit-tso and the meridional valley which is

slightly interrupted by the low threshold of Nima-lung-la (4920 m.), the open plain of Bongba-Kebyang, and finally the valley of Buptsang-tsangpo the whole way to 30° North Lat. In its present state this valley is no doubt chiefly a work of erosion, but its relation to the ranges on both sides makes it likely that the valley originally was pressed down and forced to sink. The rest of the sculpture has been achieved by erosion. The same may be said of the deep valley going down from the S. E. side of Samye-la (5527 m.), and which may be regarded as the continuation of the long depression north of the pass. The valley of the lower course of the Chaktak-tsangpo is a direct continuation of this long depression which practically cuts the whole Transhimalaya into a western and an eastern part, the latter again being cut by a third meridional line of sunken ground.

As to our first transverse line, with Rakas-tal to its west and Manasarovar to its east, its nature is more difficult to explain. We have here a fine example of Burrard's law that »the several parallel ranges of the Himalaya and Tibet tend to culminate in sympathy with each other». The strong stresses from east and west which have forced the folds to culminate on one meridional line, may also have forced the crust on both sides to sink down, forming the two depressions which gradually have been filled with water. Burrard also observes the fact that very often the passage of a river across a range occurs near the highest part of it. He tries to explain this phenomenon of contrast in different ways, one of which seems very well to suit the ordinary combination of high mountains in the immediate vicinity of deep lake depressions, the latter being a general occurrence in Tibet. His hypothesis is the following: »It may be that, as one portion of the earth's crust becomes elevated to a great height, an adjacent portion becomes depressed, in accordance with the theory of isostasy.» This seems to have been the case with the meridional line of the Kailas, the isthmus, and Gurla-mandata, as this transverse fold has a sunken part of the crust at each side. Though the general morphology at Tengri-nor is very different, the same rule occurs here.

We have seen that the Kailas Range could be traced the whole way to Surnge-la, and very likely it continues E. S. E. to the north of Gunchu-tso and Maryum-la.

Directing now our attention to the Transhimalaya, we first meet the N. W. — S. E. running range of Ding-la which probably reaches the Tsangpo in the vicinity of Tangyung (5760 m.). In its N. W. part I crossed this range at Chargo-ding-la (5885 m.). It may be that the range continues to the N. W. from the pass and that it is in connection with the Pundit's Nakchel-gangri and Nakchel-la, and perhaps with one of my passes near the source of the Indus; for instance Dam-tärngo-la, (4991 m.), or even Lamo-latse-la (5426 m.). Its length would thus be about 210 km.

Proceeding eastwards we come across a small range to which the two mountains of Lavar-naglep and Gang-chen seem to belong. This range is only 100 km. in length.



DENUDATED RIDGES NORTH OF THE BOGTSANG-TSANGPO.



SINGE-BUK, CAMP. 235. LOOKING S 73° E IN THE VALLEY
OF THE UPPERMOST INDUS.



RIDGES NORTH OF THE BOGTSANG-TSANGPO.



MOUNTAINS ON THE RIGHT SIDE OF THE UPPERMOST INDUS.
LOOKING N. E. FROM CAMP 235.

The next range eastwards is the Lavar Range which I crossed at Kyangyang-la (5157 m.), and the N. W. continuation of which is called Lavar-gangri. In the folding trough between these two ranges I found two very small lakes, the Tsi-nguri-tso and the Damrap-tso. A tributary to the Aong-tsangpo seems to pierce the Ding-la Range. The river Lavar-tsangpo flows between the Lavar Range and the range of Gang-chen and enters the Damrap-tso. The length of the Lavar Range may be about 110 km.

East of the Lavar Range extends the undulating plain of Rundor south of Nganglaring-tso. South of it, in the district of Rigi-changma, are the sources of the Sumdang-tsangpo.

To the east the plain is bordered by the Pedang Range which I crossed at Tayep-parva-la, 5452 m. high. This range seems to begin at the southern shore of Nganglaring-tso, from where it runs south and then S. S. E. to the Tsangpo, perhaps being a water-parting between the Tsa-chu and the Tsangpo. If that be the case its length would be no less than 240 km.

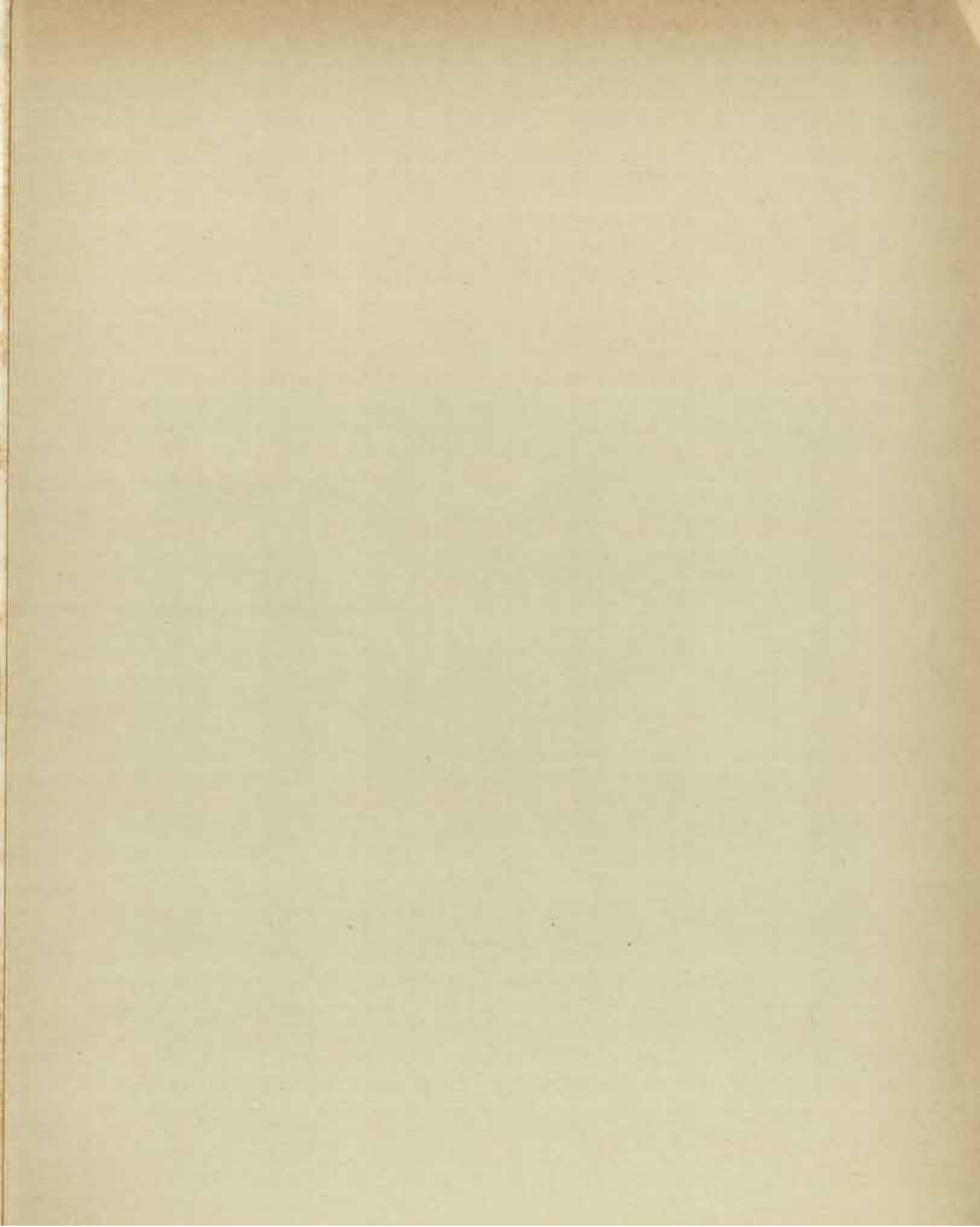
The meridional valley of Pedang-tsangpo which goes to Shovo-tso, separates the Pedang Range from its neighbour to the east, the Surla Range, one of the highest and most rugged in the western portion of Central Transhimalaya. I crossed it at Sur-la or Sur-la-Kemi-la, 5832 m. high. Its northern section, to this pass, runs N. N. E. — S. S. W. and from the pass to the Tsangpo the alignment seems to be N. W. — S. E. Its length may be nearly 300 km. From $31^{\circ} 30'$ and northwards the range seems to run S. E. — N. W. to the place where it is crossed in the high pass of Ka-la, after which it is said gradually to diminish. In its northern half the Surla Range is the watershed between the drainage areas of Shovo-tso and Poru-tso.

To the S. E. of Poru-tso two parallel ranges seem to run N. N. W. — S. S. E. The easternmost of them, the Kapta, I crossed in the pass of Chuka-la, 5320 m. high. To the western one I have given no signification as its existence is doubtful. What seemed to be a range ending at Shaktik, 5202 m., may as well be a ramification from Kapta. In length the latter will be about 110 km. or more. A circumstance which indicates that we here have to deal with only one range is that no river comes down to Poru-tso between Chuka-la and Shaktik. I need not say that the whole mountainous country to the south of my route from Tarok-tso to Nganglaring-tso is unknown, as this region of the western portion of Central Transhimalaya has never been crossed by an explorer. The ranges I have drawn here are conjectural. The reasons why I have drawn them as they appear on the map are the following: the Buptsang-tsangpo flows to the N. N. W. between two mighty parallel ranges, the western of which, Lunkar, I crossed in Lunkar-la, 5570 m. high. The next range, Kapta, crossed in Chuka-la, was obviously parallel to the Lunkar Range. Farther

west the whole way to the Ding-la Range, the folds proved to have been built up with a certain regularity. Every new range had to be crossed in a pass just as the Lunkar Range had been. The rivers were more or less parallel to the Buptsang-tsangpo, and each flowed to a salt lake just as the Buptsang-tsangpo. Conclusions could therefore be drawn by analogy, and these conclusions were corroborated by native information. Therefore it could also be regarded as certain that the passes of the great water-parting were situated between the several parallel ranges just as the Samye-la is situated between the Lunkar Range and the Kanchung-gangri. From the south, along the northern bank of the Upper Tsangpo, it is impossible to spread any new light on this part of the system. One only sees an endless series of more or less steep mountain-shoulders and ramifications bordering the valley of the Tsangpo and at intervals cut through by the moderate or small valleys of the tributaries to the Tsangpo. One indeed gets the impression that a continuous range runs along and parallel to the Upper Tsangpo. The drainage area of the Tsa-chu is also unknown, though it seems probable that most of its feeders come from the surroundings of passes of the same geomorphological importance as the Samye-la. Only the eastern feeders of the Tsa-chu take their origin from high snow- and ice-covered crests and peaks, *viz.*, those of the southern Lunkar Range and those of the northern Lunpo-gangri.

Another question which will have to be cleared up in the future, is the relation between the northern Surla Range and the Bongba-yeke-gangri. It is true that I, on my journey from Poru-tso to Shovo-tso, got the impression of the existence of two parallel ranges. If there are two, the little Surla River which takes its origin from the glaciers to the west and south of the Sur-la-Kemi-la, pierces the Bongba-yeke-gangri in the transverse valley by which its water reaches the Poru-tso. But on the other hand, the Bongba-yeke-gangri may as well be a part or a ramification from the main Surla Range, from the northern section of which other ramifications of the same kind may easily fall to the east.

The next crustal fold is of great interest not only on account of its length, which is some 760 km. to Yamdok-tso, but also because it presents a means of connection with the orography of Burrard. From the region west of Tarok-tso it runs from N.W. to S.E. and gradually turns to the right, *i. e.*, N. N.W.—S. S. E. under the name of the Lunkar Range. Near Tarok-tso I crossed it in the pass Lunkar-la, 5570 m. high, and found it here as sharply and well defined as the whole way along its eastern side, where I had seen it from the valley of the Buptsang-tsangpo, from Samye-la and from the valley S. E. of it. From 30° North Lat., or in the region opposite to Samye-la, its stretching becomes N.W.—S. E., and here are the highest peaks of the range called Lunpo-gangri. From the region where it is pierced by the Chaktak-tsangpo, and where I have seen it from the east, south





THE CHOMO-UCHONG. VIEW TO THE S. E. AND EAST FROM LAMLUNG-LA, MAY 1, 1908.

and S.W., it again changes its direction and now runs W. N. W.—E. S. E. At $85^{\circ} 25'$ East Long. I crossed it at Lamlung-la, 5118 m. high, and a few kilometers further east in the deep transverse valley of Rong-chu, the upper Sa-chu. The group of Chomo-uchong belongs to it. Just east of the latter I crossed the range in Kule-la, 5088 m. high, obviously Ryder's Ku-la to which he gives 5091 m. Thence it continues nearly straight east, between the Raga-tsangpo and the Tsangpo-Brahmaputra where it has been crossed by a Pundit in Cha-zang-la, and by Ryder's expedition in Gang-la. Still farther east the range is pierced by the great river at Ladse-dsong. East of Ladse-dsong the range runs on the southern side of the Tsangpo. Eastwards it probably continues much farther than 92° East Long., where it ends according to Burrard. This question has to be settled in the future. It would not be easy to say whether the section of the range which is situated to the east of Ladse-dsong and south of the Tsangpo belongs to Transhimalaya or Himalaya. I would say to both systems. For if we speak of the original tectonic structure it certainly is the prolongation of the Lunkar—Lunpo-gangri—Chomo-uchong fold and therefore belongs to the Transhimalayan system of earth-waves. But if we attach more importance to the orographical arrangement, it would perhaps be more correct to say that it is a part of the Himalayan system. In the latter case the Tsangpo should be regarded as the boundary between the two great mountain systems. In its eastern section the range may be said to be a bridge joining the Transhimalaya with the Himalaya, thus giving a new support to the name Transhimalaya.

We have now finished with the western region of Central Transhimalaya. The central part, as I have said before, is situated between the two meridional lines of rift-valleys between fractures and faults, and has been compressed and crumpled in a most violent way. Beginning in the south we find what I believe is the westernmost section of the Nien-chen-tang-la. It begins S. E. of Samye-la where it is pierced by the deep-cut valley of Rukyok. Some 20 km. farther east it is pierced by the upper Chaktak-tsangpo in a deep, wild gorge. Another 24 km. farther east I crossed it in Gyägon-la, 5490 m. high. W. N. W. of this pass it has some fairly high peaks which, like the great range farther north, were called Kanchung-gangri by the Tibetans. Some 78 km. farther east I crossed it in the pass Sao-lungring, 5387 m. high. Between the two last-mentioned passes at least a part of the range was called Lombo by my guides, a word that is certainly the same as Lunpo. Still, I have left it on the map as I heard it. The effluent from Amchok-tso, Dongmo-chu, pierces the range between rather high, partly snow-covered mountains.¹ Except the Rukyok- and Chaktak-tsangpo, the Dongmo-chu seems to be the single river piercing the range in this region.

¹ In Vol. III, p. 295 it is said that the river leaves the lake from its N. E. corner, which of course is a misprint for S. E. corner.

About 150 km. E. N. E. of the Sao-lungring Pass the Nien-chen-tang-la is pierced by the Mū-chu in a meridional, deep-cut valley. To the south of this section of the range there are other small ranges and ridges which may perhaps be regarded as ramifications from the main range. In the latitudinal valley north of it the Kyam-chu flows west to Amchok-tang and enters the Amchok-tso, and the Lenjo flows to the east joining the Mū-chu.

Continuing east, I crossed the Nien-chen-tang-la in the pass of Dangbā-la, 5250 m. high. Then follows a long interval of 208 km. to Khalamba-la, 5244 m. high. In this pass the Nien-chen-tang-la was crossed by NAIN SING and COUNT DE LESDAIN. Only 34 km. N. N. E. of Khalamba-la is Goring or Guring-la, 5972 m. high, and crossed by LITLEDAL. This is the highest known pass of the Nien-chen-tang-la. From here the pass altitude as well as the altitude of the peaks and crests decreases both to the west and to the east. In the latter direction we have 95 km. to the next pass, Dam-largen-la, 5152 m. high, which was used by NAIN SING, and 70 km. to Shangshung-la which seems to have been used by Fathers HUC and GABET. The group of Samden-khansa is situated between the two last-mentioned passes. East of Shangshung-la the Nien-chen-tang-la is nearly unknown, though it seems to bow gradually to the S.E. and to be parallel to the upper Salwen which flows along its northern and eastern base. Regarded as a whole the Nien-chen-tang-la Range is parallel to the main axis of the Transhimalaya and to that of the Himalaya. In the west, where it is pierced by the Rukyok valley, it overlaps the Lunpo-gangri, and comes in between it and Kanchung-gangri. It is, from its western end to Amchok-tso, fairly parallel to these two ranges, though it seems to be less sharply curved than the Kanchung-gangri.

Proceeding from south to north in the central region of Central Transhimalaya we come to the semicircular range of Kanchung-gangri. From its N. W. end in Kebyang I have travelled along the western flank of its western half. In the east I have travelled along the eastern flank of its easternmost section and of the ranges which seem to form its meridional continuation up to Dangra-yum-tso, Rong-särchen-kang, Umbu, Gangri-do, Targo-rigüt, and Targo-gangri. Exactly in the middle of these two routes, and between the two meridional rift-valleys, I crossed the Transhimalaya up to Teri-nam-tso. On this route the Kanchung-gangri was crossed in Damche-la, 5418 m. high and situated some 8 km. east of the deep-cut gorge in which the Chaktak-tsangpo pierces the range.

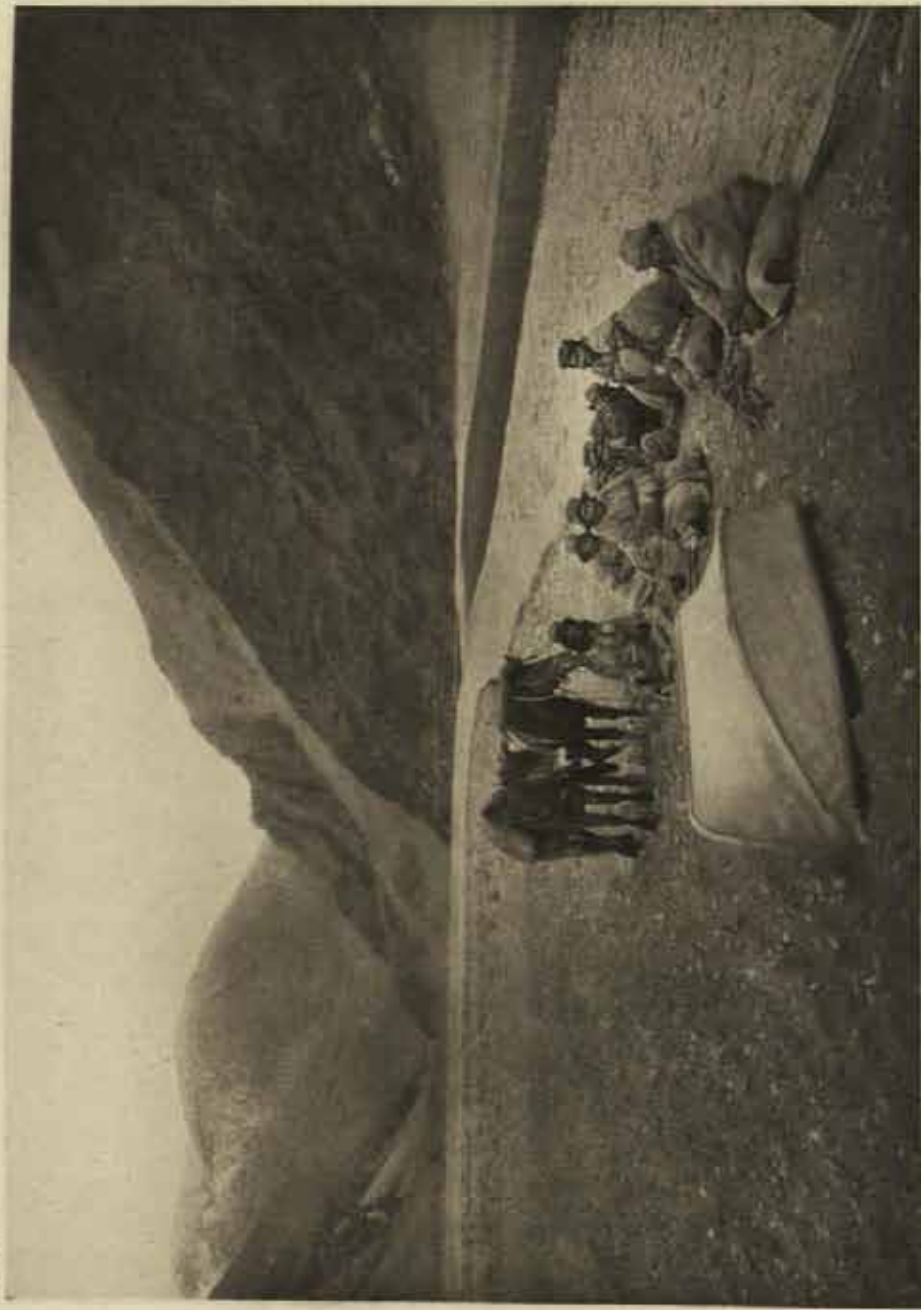
The little lake north of Kanchung-gangri through which the upper Chaktak-tsangpo flows, is called Lapchung-tso; the surrounding region is called Lap, and the mountains to the north Lapchung.

I have therefore called the next semicircular range the Lapchung Range. I crossed it in its central part at Sangmo-bertik-la, 5820 m. high. Here one is not in

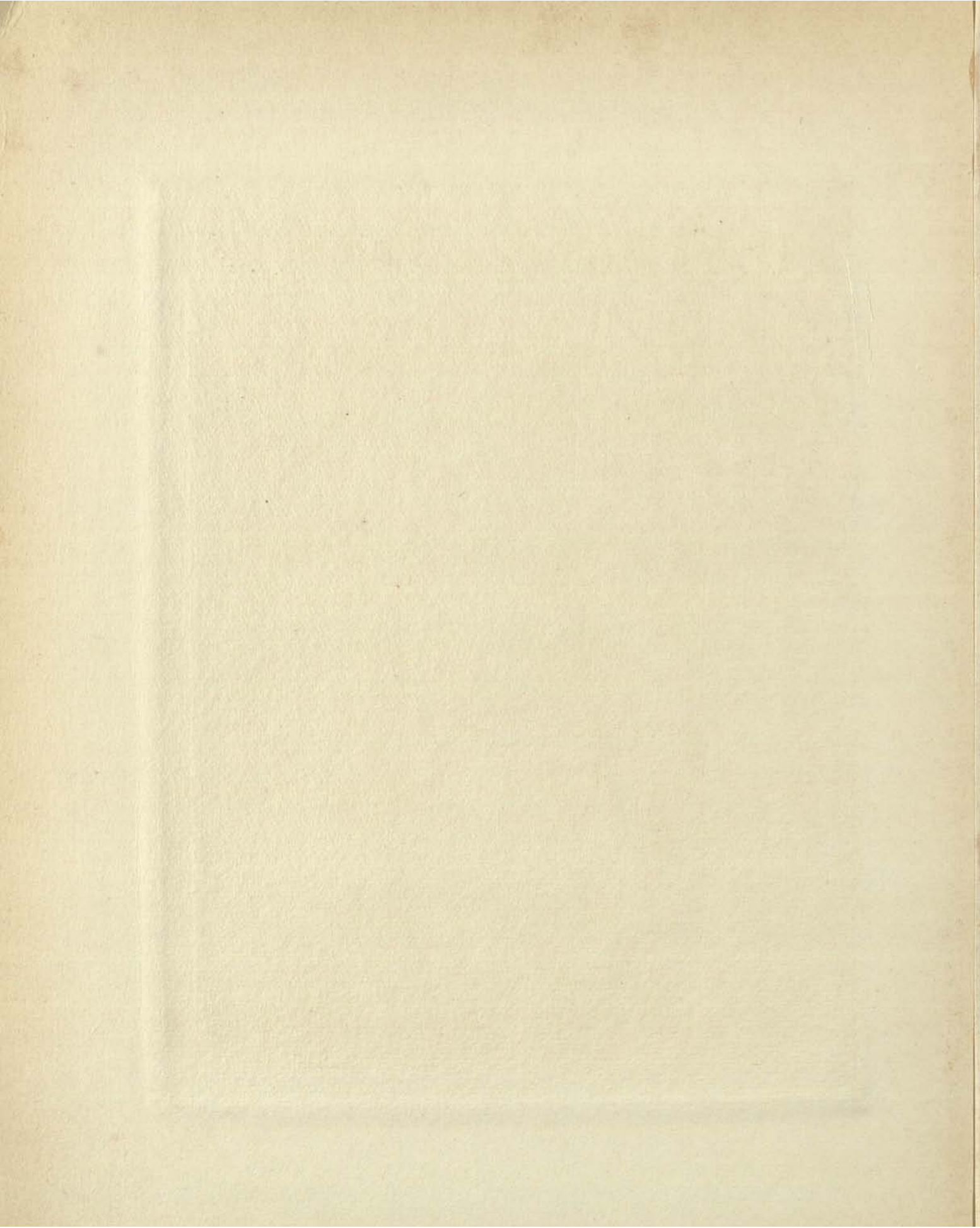
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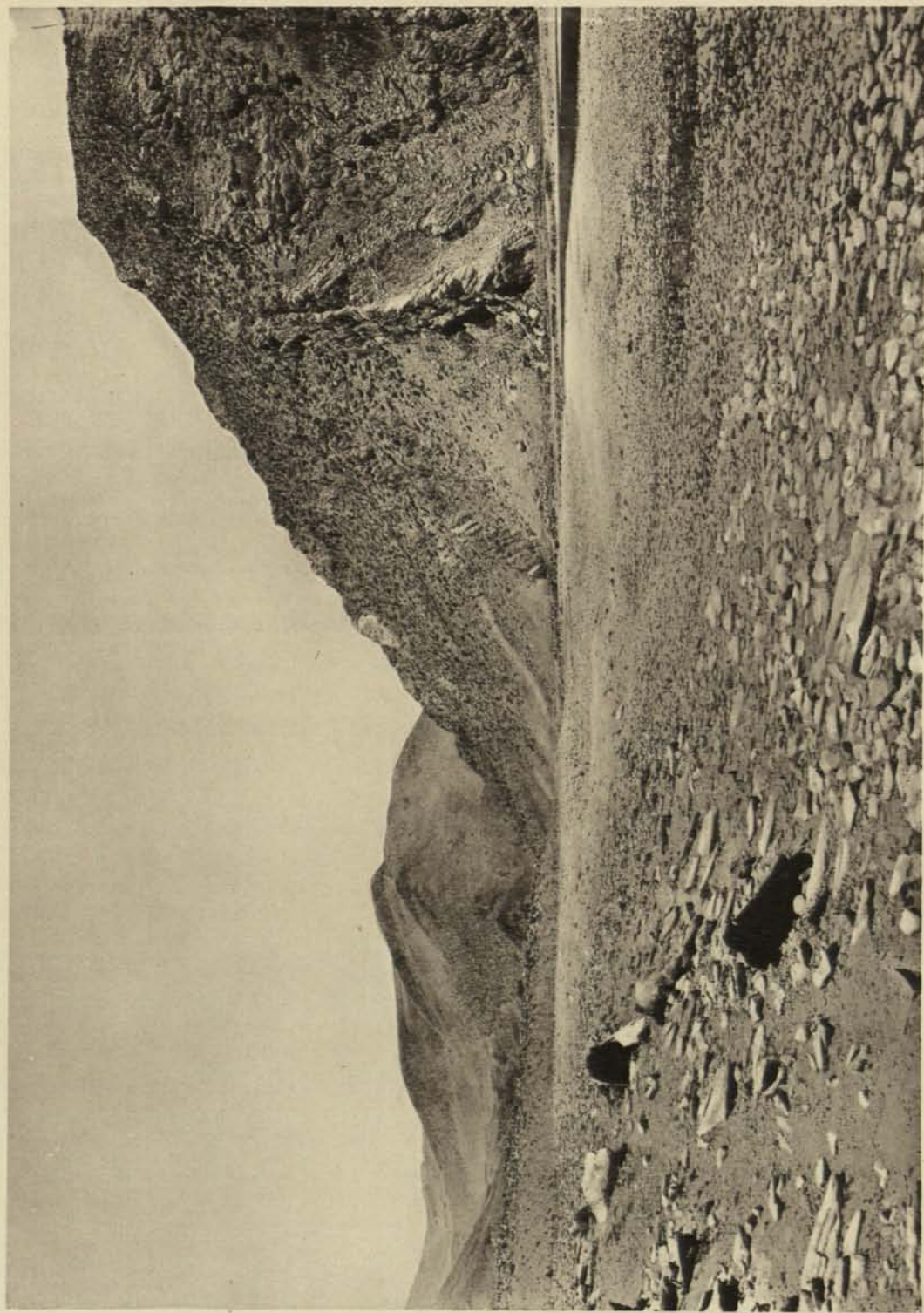


THE CONFLUENCE OF BUT-CHU AND MU-CHU AT LINGA. THE MU-CHU BRIDGE. IN THE BACKGROUND THE UPPER PART OF THE MU-CHU VALLEY. LOOKING NORTH FROM A POINT JUST BELOW CAMP 142.



LOOKING DOWN THE MU-CHU VALLEY TO THE S.S.E., FROM THE CONFLUENCE OF THE BUP-CHU WITH THE MU-CHU.





THE MU-CHU VALLEY NEAR LINGA.

the slightest doubt about the mighty regularity and the eastward and westward stretching of the range. Its N.W. part, along the east side of the valley of the Buptsang-tsangpo, seems to be less certain. After an interruption formed by the plain of Kebyang the range seems to continue N.W. along the western side of the valley of Buptsang-tsangpo and then along the eastern or N.E. shores of Tarok-tso. In this section of the range we find the names Gyäsong-ri, Chokbo-ri and Elung-ri.

N.E. of Damche-la two high mountain groups are called Tsa-timyang-gangri and Nakbo-gongrong-gangri. Farther east the range gradually changes its direction to the north. As I have not crossed this part of Central Transhimalaya, but only have seen it from afar, the orography as presented on the 1:1000000 map is conjectural, and will certainly have to be much improved in the future. Gangri-do was the name by which the natives called the high and steep mountains just west of Shuru-tso. It is, however, possible that this name only appertains to a certain region amongst these mountains. The Shuru Range is the appellation I have given to the mountains west of Shuru-tso. But I cannot tell with certainty how the different ranges in this region are arranged in relation to one another. It seems most probable that the Rong-särchen-kang, Umbu, Gangri-do, Targo-rigüt and Targo-gangri form the uninterrupted continuation of the Eastern Kanchung-gangri. Some informants called the mountains along the whole western shore of the lake »Gangri-do», others said that these were only a part of it, other regions, to the S.W., being called Gangri-masa, and to the W.S.W. Tsari-nakpo. The following features seem to be certain: West and S.W. of Targo-gangri is a very considerable and partly snow-covered mountain range, the N.E. section of Lapchung-gangri. The latter is connected with the Targo-gangri range by a mountain bridge carrying the pass Barong-la, Targo-barong-la or Parung-la, famous in the region. So far as I could make out, this pass is a comparatively flat threshold in a meridional valley between the two ranges. The Lapchung and Kanchung-gangri Ranges are therefore, both in the east and west, separated from one another by long open valleys. For, from my Camp 402 my guides showed to the N. 61° W. a low and flat threshold called Dicha-la. A road crosses this pass and continues to the lower Buptsang-tsangpo following the long-stretched tanga or plain situated between the two ranges.¹

The next mountain fold situated to the north and inside of the Lapchung Range is too uncertain to be given a special designation. My meridional route from Sangmo-bertik-la to Teri-nam-tso is here of no assistance, as it did not cross any

¹ In this connection I would invite the reader's attention to the panoramas of the Atlas corresponding to the camps from which the different ranges are visible, as well as to the photographs I have taken during the journey. To take an instance, the mountains west of Shuru-tso are visible on the photogr. panorama IV A in Vol. IV, p. 348, and on the first, third and fourth photo., p. 290 of Vol. III. The text to the first of these three is correct, only in case the Lapchung range raises its snow covered crests above the Gangri-do which is in front of it. This question is doubtful.

pass before reaching the Teri-nam Range. Still it is probable that we have to do with a range beginning east of Tarok-tso and running S. E. and east. The Nimalung-la, 4882 m. high, should be situated on it. East of Saglang-hlungpa it runs along the southern shore of Karong-tso, as may be seen on the coloured panorama opposite p. 392, Vol. IV, where the Lapchung Range is also beautifully seen in the background.

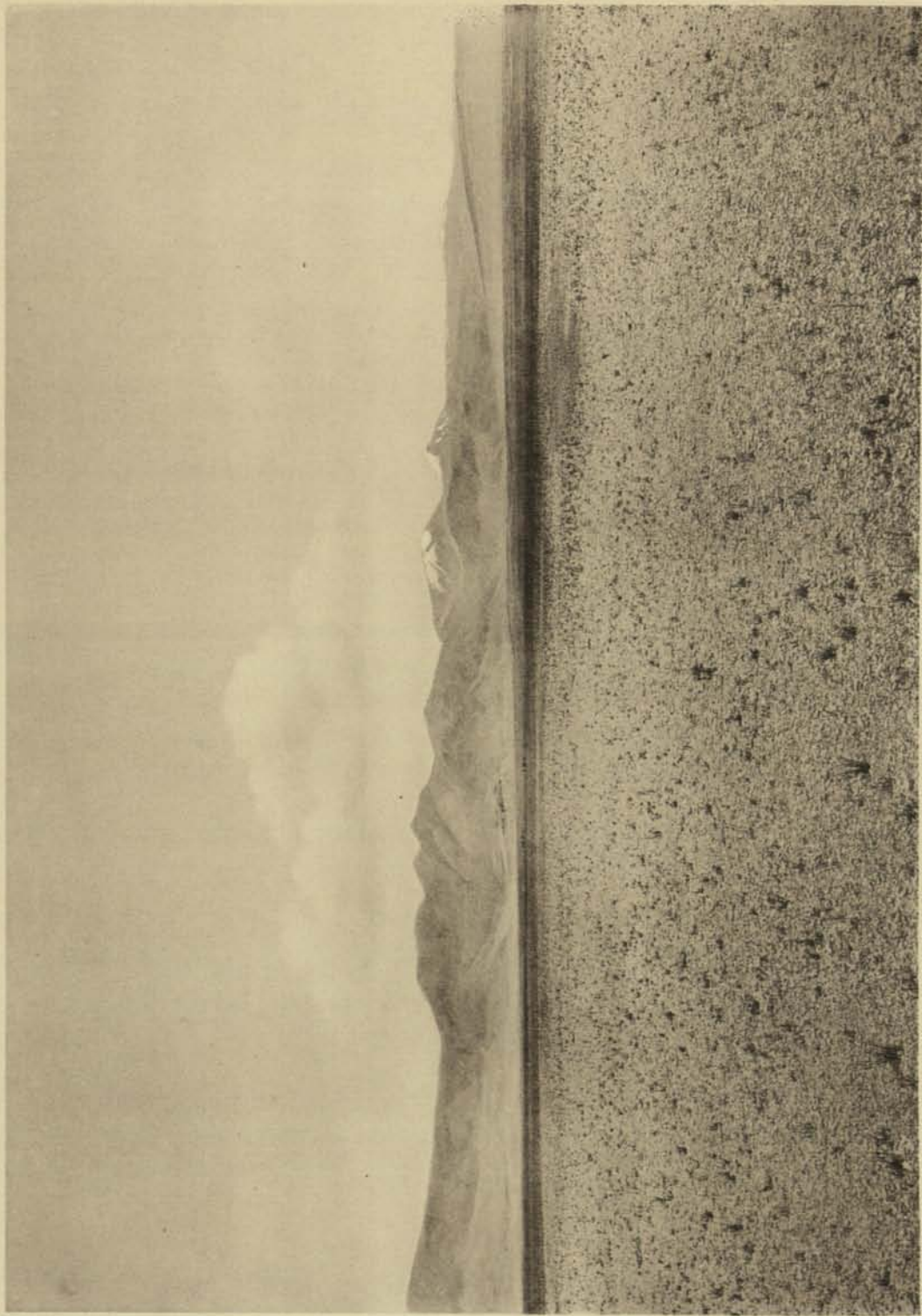
The next fold to the north borders to the south the valley of Soma-tsangpo, and runs east and north of Karong-tso and Chunit-tso. I have crossed it in two passes, *viz.*, the Goa-la, 5298 m. high, and Satsot-la, 4805 m. high. The latter range has about the same length as the former. They could be called the Karong Range (the one on the southern shore of this lake), and the Soma Range (the one on the southern side of the Soma valley).

Finally we have the Teri-nam Range between the Upper Soma-tsangpo and the Teri-nam-tso. I crossed it in Dongchen-la, 5113 m. high. Its length to the sharp bend of Soma-tsangpo is only 100 km., but if we add the section west of the river, it becomes about twice as long. In front of it a very small range, the Domar, runs along the very shore of the lake.

Leaving the central portion of Central Transhimalaya we now proceed to the eastern portion of the system, *i. e.* so far as I know it, and continue our investigation beyond the eastern limit of my expedition.

Of the Nien-chen-tang-la we have already talked, and have arrived at the conclusion that it stretches far away to the west, thus belonging to the whole eastern half of Central Transhimalaya as well as, probably, to the whole of Eastern Transhimalaya.

North of the Nien-chen-tang-la is the Pabla Range. I first struck it in the Sela-la, also called Se-la, 5506 m. high. To the W. S. W. the Chang-la-Pod-la, 5572 m., the Sha-la, and the Angden-la, 5643 m., are certainly situated on this range. In the west the groups Lombo, Kungri-rakpa and Gablung seem to belong to it. Its westernmost section thus comes in between the Kanchung-gangri and the Nien-chen-tang-la and is parallel to them. From Chang-la-Pod-la it runs S. W.—N. E. to Sela-la, and from there to Tengri-nor its stretching is nearly east. East of Sela-la the Pabla Range carries the group of Kyar with some snow-covered peaks of moderate height. The Tagrak-tsangpo has its source on the Pabla, and that is no doubt also the case with Bara-tsangpo, Ota-tsangpo and Thama-tsangpo. In its easternmost section the range has been crossed by LITTLEDALE and DE LESDAIN. Between their routes and Sela-la, the Pabla Range is perfectly unknown. When I reached the pass, and even later, I felt sure that it was situated in the same range as Khalamba-la, Goring-la and Dam-largen-la. As a result of more careful study of the rest of my routes in Transhimalaya and of the other meager material existing,



THE MOUNTAIN RANGE OF PARVI-PU AS SEEN FROM POINT 4763 m
BETWEEN CAMP 151 AND CAMP 152.
(THE TWO SNOW-COVERED PEAKS: S 44° E AND S 40° E.)

I had to change this view in the manner described in Vol. III of this work and on my orographic maps. On the map in 1:1000000 I am afraid the Pabla Range has been drawn some ten miles too far south. But as I said before, both its situation and its general orography are unknown. The curious, nearly isolated snow-covered group of Do-tsänkang (*vide* two photos opposite to p. 290, Vol. III) belongs to this range. The Kyam-chu, the river of Amchok-tang, flows between the Pabla and the Nien-chen-tang-la.

A more detailed knowledge of this complicated world of mountains will certainly bring to light several other parallel ranges of lesser order. But even now I believe in the existence of one secondary range situated between the Pabla and the Nien-chen-tang-la. In its western section it is the water-parting between the Pashu-tsangpo (the river flowing eastwards from Chang-la-Pod-la), and Lenjo-chu, a tributary to the Mū-chu. Taribo, Kaso, Tsari and Takar are mountain regions on it. It is pierced by the upper Mū-chu in a transverse valley. Some 22 km. farther E. N. E. the Chesang-la, 5474 m. high, is situated on it. In a latitudinal valley south of it flows the Bup-chu, a left tributary of the Mū-chu, and north of it is the latitudinal valley of Muva-chechen, also a left tributary of the Mū-chu. It acts as a water-parting between both. In the easternmost part of this range, which might be called the Chesang Range, there is the secondary pass of Kyang-la, 5000 m. high.

North of the Pabla Range and east of Shuru-tso there is a little range which may be called the Parvi-pu Range after a group of flat snow-peaks of this name (*vide* photo on opposite page). The Tarbung-la is situated in this range, 5267 m. high, and it is pierced by the Targo-tsangpo in a gorge probably narrow and uncomfortable, as the road sticks to the heights N. E. of it.

The range running on the eastern shore of Dangra-yum-tso and N. E. of the valley of the lower Targo-tsangpo could be called the Largāp Range. In its northern section NAIN SING crossed it in Chuku-la, 5050 m. high, and north of this pass he saw the peak Kandigar, 6290 m. high. The range is the water-parting between Dangra-yum-tso and Ngangtse-tso. It is chiefly meridional as are other ranges on both sides of the rift-valley, our second meridional line of violent compression. Along the Targo-tsangpo the range is well developed and seems to turn S. E. and east. However, with our present knowledge it is impossible to say with certainty anything regarding the orography of this district. It may be that the Largāp Range should rather be regarded as an immediate continuation of the Parvi-pu. If this be the case, the range is pierced by the Nagma-tsangpo, and shows a remarkable parallelism with the Targo-gangri, Targo-rigūt, Gangri-do and Umbu. In accordance with the ranges, the rift-valley goes in a zigzag, N. N. E.—S. S. W., N. N. W.—S. S. E., N. E.—S. W., and finally, at Amchok-tso, N. N. W.—S. S. E. This also is a proof of the strong torsion and violent lateral compression to which the earth's crust has been exposed in this region.

Along the left side of the valley of the Tagrak-tsangpo there runs a range which could be called the Tagrak Range. It is some 150 km. in length and seems to be bowed towards the south, as are other ranges in this region. It goes through the district of Tova-tova, and is pierced by the broad and open valley of the Naong River. How far it continues in the direction of Bara-tsangpo is unknown, though it may easily be pierced by this river. Between the Tagrak Range and the next range to the north of it there is a curved latitudinal valley. From its eastern half a tributary, Kung-tsangpo, comes down to the Naong-tsangpo which, together with other feeders in the region, form the Tagrak-tsangpo.

The Ngangtse Range has to the south the valley of Tagrak-tsangpo, and to the north Ngangtse-tso and Marchar-tso. I crossed it in Ponchen-la, 5371 m. high. A little range is situated south of the eastern half of Ngangtse-tso, with the pass Chapkar-la, 5326 m. high. Perhaps it should rather be regarded as a ramification from the Ngangtse Range, and so I have drawn it on the little orographic map accompanying the last chapter of this volume.

North of Ngangtse-tso runs a range W. N. W.—E. S. E. which I crossed in Lamlung-la, 5179 m. high. It probably continues to the region south of Chikut—or Tsikut-tso—and approaches the western shore of Kyaring-tso where it was crossed by NAIN SING in 1874.

The Ngangtse Range seems to continue to the east the whole way to Tengri-nor. In this region the orography of NAIN SING is very vague. This is not surprising, as he had no opportunity to cross these mountains. But he saw mountains at no great distance south of his road the whole way to Tengri-nor, and very likely the lake basins of Kyaring-tso, Mokieu-tso and the small lakes east of the latter are bordered to the south by a range, as is the case with Ngangtse-tso, Teri-nam-tso and many other lakes. The existence of a latitudinal range is at any rate more likely than the curious meridional ranges between Bara-tsangpo and Ota-tsangpo as drawn on NAIN SING's map. The latitudinal range has been called Nain Sing Range by Colonel BURRARD, and I have of course accepted the proposal, though I regard it only as a provisional one. For in the future we will find local names, as Gya-kharma or others, and then the invented personal name which is unknown to the Tibetans, will have to disappear. Between and north of Nain Sing's lakes there are small ranges chiefly with a west-east alignment.

It only remains to say a few words about the ranges situated to the south of the Eastern Nien-chen-tang-la. We have seen above that the western portion of the latter range is pierced by the Rykyok-chu, the upper Chaktak-tsangpo, the Dongmo-chu, and the Mū-chu. In the region of Dangbā-la it forms a water-parting and is not pierced by any river. East of this pass, which is situated on my easternmost transverse crossing of the Transhimalaya, the gigantic range, so far as is



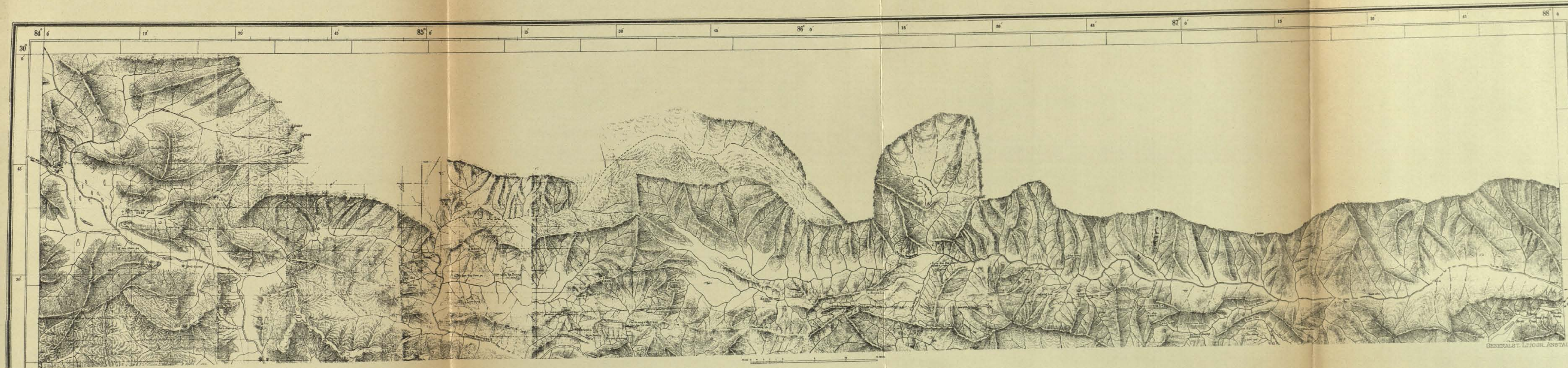
India and adjacent Countries. Sheet No. 71.
Published 1904, three years before my journey 1906—1908.

known, seems not to be pierced by a single river. But several northern tributaries to the Tsangpo take their origin from the southern side of the range, as the Tanakbo, the Shang-chu coming from Khalamba-la, the To-lung-chu, a tributary from the right to Ki-chu coming from the region of Goring-la, and finally all the different feeders of the Ki-chu itself, explored by Nain Sing and A—K—, and taking their origin from the highest parts of the Nien-chen-tang-la. Two of these feeders, one coming from the Baknak-la, 5438 m. high, and flowing to the N. E., and the other, Dam-chu, partly coming from Dam-largen-(or niargan-)la and flowing S. W., occupy a latitudinal valley between the Nien-chen-tang-la and a nameless range S. E. of it; a range that is pierced by the upper Ki-chu and its tributary Migi-chu, and seems to continue far away to the N. E. The continuation of the same range may be traced to the S. W. of Baknak-la where it is pierced by the Shang-chu, and farther W. S. W. by the Tanakbo. My pass La-rok, 4440 m. high, is probably situated on this range which still farther west is pierced by the Rung-chu and probably also by the Mū-chu. A little branch from this range is pierced by Tanakbo, runs along the northern bank of the Tsangpo and comes to an end near Ye. East of it another range runs along the Tsangpo and is pierced by the Shang-chu. Farther east it is crossed by the To-lung-chu, runs just north of Lhasa between the Ki-chu and its right tributary Penyu-ne, is crossed by the Ki-chu and continues a considerable distance E. N. E. and N. E. North of the river Penyu-ne and occupying the space between it and the upper Ki-chu, there is another range, of course parallel with the rest of the Nien-chen-tang-la ranges. Finally we have a range south of Lhasa running along the northern bank of the Tsangpo and crossed in a transverse valley by the Ki-chu. This region has been scientifically explored and mapped by YOUNGHUSBAND's mission, 1903—1904. I have abstained from giving these ranges provisional significations, as I do not know the Eastern Transhimalaya by my own experience.

Such are the principal features of Central Transhimalaya as they are known at the present time. On my map of this vast region we now find a labyrinth of mountain ranges, lakes and rivers, and a great number of geographical names where the maps published by the Survey of India two or three years before my journey are absolutely blank. From his route north of Ngangtse-tso and Dangra-yum-tso, Nain Sing could see mountains to the south. These mountain ranges were entered on all maps for some 30 years. What they were like is seen on the accompanying map which I have reproduced as a specimen, Pl. LXXIII. It is Sheet No. 71 of the map published by the Survey of India and called »India and Adjacent Countries.» We may take for granted that all material in existence was made use of for the compilation of this map. The ranges south of Nain Sing's lakes should be compared

with the ranges drawn on Sheet XIV of the map in 1:1000000 showing the result of my exploration in Central Transhimalaya.

RYDER's beautiful and important map of his exploration along the valley of the Tsangpo, and of a part of which Pl. LXXIV is a reproduction, gives an idea of the continuous range which was supposed to run along the northern side of the Tsangpo valley as a sharp and marked natural boundary between this valley and the Tibetan plateau-land which, on Ryder's map, with good reason is left absolutely blank. To a traveller in the Tsangpo valley the mountains to the north indeed make an impression as if they formed one single continuous range. But a traveller crossing the Central Transhimalaya will easily find how erroneous this conception is.



A part of Ryder's map, published 1905, and showing the natural boundary
of the unknown country to the north.

CHAPTER LXII.

THE RANGES OF CENTRAL AND NORTHERN TIBET.

In the preceding chapter we have seen that the Kailas Range of BURRARD, the same that is called Saltoro Range by NEVE, is pierced by the Nubra, the Upper Shayok, the old Panggong River and the Singi-kamba or Upper Indus. The Sajum, Jukti-la and Surnge-la belong to it. E. S. E. of the latter the Kailas Range is continued by the Transhimalayan system.

Now the question arises: which is the next crustal fold or mountain system to the east and north, *i. e.* towards the interior of the Tibetan highlands?

I have already mentioned that the comparatively deep depression from Selling-tso to Panggong-tso is bordered to the south by a mountain protuberance marked by ten passes, the mean altitude of which was found to be 5174 m. Obviously these passes do not necessarily belong to one and the same mountain range. On the contrary, there exist between the latitudinal depressions whole systems of more or less parallel ranges, some of them quite insignificant, short and interrupted, others considerable and possessing eternal snow and short glacier tongues. It should also be remembered that the rivers as a rule are older than the mountain ranges, and that the crustal folds have been formed quite independently of river beds. The relations between the Ladak Range and the Indus present a good example of this fact.

Inside or N. E. of the Kailas Range, BURRARD has the Kara-korum Range running S. E., E. S. E. and east, and joining the Nien-chen-tang-la south of the Upper Salwen on 92° East Long. At about 80° East Long. Burrard has sketched both the Kailas and the Kara-korum with dotted lines, as in this region the connection to the S. E. is indeed uncertain.

The same range is called Central Karakoram or Masherbrum-Saser Range by NEVE. On stratigraphical as well as orographical grounds he differentiates the great central granite mass of the Kara-korum from the North Kara-korum which is much younger and largely consists of limestones, emerged from the sea.

This range, the Central Kara-korum, is pierced by the Upper Shayok. Its south-eastern continuation fills up the triangular space between the Shayok, the

Chang-chenmo River and the Kograng-sanspo. Farther S. E. it is impossible to speak of one continuous range. South and S. E. of Chang-chenmo the Central Kara-korum, in the same way as the Kailas east of Surnge-la, is dissolved into a system of crustal folds, and it may be a question of taste in what degree these ranges should be regarded as parts of the Central Kara-korum. In this region the relations between the Kailas Range and the Kara-korum are very complicated. Just north of the north-western end of the Panggong-tso we may even talk of a bifurcation of the Kailas Range, *viz.*, 1. a south-eastern branch which continues down to the Sacred Mount Kailas, and 2. an eastern branch which borders the Chang-chenmo valley to the south.

South of the latter there is a labyrinth of ranges and groups sending their ramifications down to the northern shores of Tso-ngombo. In this labyrinth of mountains it is impossible to follow any principal alignments. Several ranges seem to have their roots in this mountain knot. One of them is pierced by the transverse valley of the western Tso-ngombo, and stretches S. E. parallel to the Kailas Range. It is pierced by the river that enters Tso-nyak from the south, and farther S. E. by the Singi-kamba. In Paba-la, 5277 m. high, it was crossed by Nain Sing in 1867, and in Dotsa-la, 5045 m., by me 40 years later. Continuing S. E. it is again crossed by the Upper Indus in Singtod. My Lamo-latse-la, 5426 m., is probably situated in it. It seems very likely that the Nakchel-la and Nakchel-gangri of the Pundit belong to it, and that it is in connection with the Ding-la Range of Transhimalaya. When dealing with the Ding-la Range in the preceding chapter we presumed that the Nakchel-gangri and Lamo-latse-la were parts of its N. W. continuation, and thus one of the Transhimalayan folds may be traced the whole way up to the Kara-korum. But as we have seen, the connection of this fold is rather unclear in the vicinity of Panggong-tso, and this orographical feature therefore to a certain extent is founded on a hypothesis.

A second branch from the above-mentioned mountain knot is pierced by the lowest part of the Tsanger-shar valley and is interrupted by the Tso-nyak. East-south-east of the latter it fills the space between the two latitudinal valleys which are signified by the routes of NAIN SING, 1874, and LITTLEDALÉ, 1895. Farther E. S. E. it was crossed in Dundok-la, 5090 m. high, by DEASY on his journey 1896—1899, and in 1901 by me at Dung-ka, 4858 m. It no doubt continues much farther E. S. E., though it is impossible to trace its stretching.

Between the two last-mentioned ranges and south of Littledale's route, we come to a very strongly developed fold, the culminating part of which is Alung-gangri, about 7000 m. high. The Alung-gangri must therefore no doubt be attributed to the same system of folds as that which has its highest portion in the Central Kara-korum. However, from this deduction it becomes evident that it is impossible to

trace anything that could be called an uninterrupted series of folds. But even with our present scanty knowledge of the orography of Western Tibet we may say that there does not exist a regular series of folds in this region. The Central Kara-korum therefore can not be traced for hundreds of miles as is the case with the Ladak Range on Burrard's map. The orographical arrangement of this part of the Central Kara-korum seems to be very much like that of the Kailas Range, which can be traced to Surnge-la and then is dissolved into a complicated system of secondary folds. Beyond the Chang-chenmo the case is the same with the Central Kara-korum. So far this enormous range stretches from N. W. to S. E. with decreasing altitudes of its gigantic peaks. But south of the Chang-chenmo the continuation of the range is transformed into a series of transverse ranges, no more running N.W.—S. E. as the Central Kara-korum, but W. N. W.—E. S. E., overlapping one another just as the ranges of Western Central Transhimalaya, and in some cases connected with one another in their western parts by bifurcations. We have no absolute proof of the continuity of the system. But by way of orographical analogy we may feel persuaded that the Alung-gangri belongs to the same series of crustal folds as the Central Kara-korum, and for this conclusion we find a strong support in BURRARD, who brings the Kailas Range of Tibet into uninterrupted connection with the Saltoro Range of the Kara-korum. The parallelism is evident the entire way.

Thus the orography has become very complicated in the region north of the Panggong Lakes, and this is the reason why I have spoken of a mountain knot from which several ranges or systems of folds start. We have just dealt with two of them, the one being in connection with the Ding-la Range and the other in connection with the Alung-gangri.

A third main range, or rather system of ranges, issuing from the same mountain knot is the one which has been mentioned before as forming the northern water-parting of the Selling-tso—Panggong-tso depression, and in which we found ten passes with a mean altitude of 5275 m. Before considering this comparatively high protuberance we will have to trace the stretching of its nearest neighbour to the south, which forms the southern water-parting of the Selling-tso—Panggong-tso depression.

We have already followed it to Alung-gangri, a name that may be chosen for signifying the whole protuberance. From there it runs S. E. and E. S. E. passing north of and very near to Thok-jalung, 4958 m. At Shelkongda, 4877 m., it was crossed by LITTLEDALE. Mount Kuhanbo-kang-la, 7218 m. (?), may be situated on it. In the region north and N. E. of Yumba-matsen the Alung-gangri system seems to consist of at least two ranges which diverge from one another south of Kuhanbo-kang-la. It is not a bifurcation, but simply a separation or divergence of two ranges, which for a long distance have been parallel. The southern branch, of which Sumar and Taben are parts, runs along the northern and N. E. shores of Nganglaring-tso.

by LITTLEDALE, and some 25 km. farther east by me in a nameless pass of 4809 m. Eighty km. E.N.E. of this point I crossed it July 31st, 1901, in a pass 5100 m. high. A short distance farther east it has been crossed by BONVALOT, BOWER (5072 m.), and ROCKHILL. Beyond this point it stretches E. S. E. through Amdo. Returning to the west we find on BURRARD's frontispiece map the Aghil Range of YOUNGHUSBAND in connection with the Sarikol Range to the N. W. and east-south-eastwards continuing all the way through Tibet, and finally turning S. E. between Mekong and Salwen. On NEVE's sketch we have the North Kara-korum as the next neighbour of the Central Kara-korum. As a matter of fact the Aghil Range follows as the next neighbour N. E. of the North Kara-korum. The last-mentioned fold is of great interest as it really seems to be in connection with the famous Tang-la Range in the east.

Far in the N. W. a parallel range or bifurcation of the North Kara-korum carries the saddles of Shimshal and Min-teke. The main range sends out the Hispar, Biafo and Baltoro Glaciers to the south. The Mus-tagh pass belongs to it and so do K 2, 8610 m., the Gasherbrum, 8035 m., Younghusband's saddle, 6410 m., and the Teram-kangri, 7472 m.¹ The Kara-korum Pass (5658 m. according to my observations; 5655 m. according to BURRARD), is also situated on the North Kara-korum Range. From the northern side of this part of the range the water flows to Raskem-darya and other tributaries of the Yarkand-darya. Some 30 km. S. S. E. of the Kara-korum Pass is the Dapsang Pass, 5428 m., on the same range which from here stretches to the S. E., being a water-parting between the Shayok and the self-contained basins of Ling-shi-tang and Aksai-chin. The Changlung-yogma, 5780 m., and other passes in the vicinity belong to it. From Lumkang-la, 5553 m., the range continues due east to the north of the upper Chang-chenmo and Lanak-la. East of the latter it has peaks of 6282 m., 6742 m. and 6438 m. Then it turns S. E. along the southern shores of Arport-tso and Shemen-tso. South-east of the latter lake the range is pierced by the valley of an affluent to Shemen-tso which I, in 1908, followed upwards to a threshold of 5655 m., situated in the latitudinal valley between the North Kara-korum and its nearest neighbour to the south. The range then stretches east, E. S. E. and finally east. BOWER travelled along a part of it and crossed it in a nameless pass of 5380 m., and 62 km. east of the latter pass I crossed the range (1906) in Chakchom-la, 5433 m. high. Another 110 km. eastwards it was crossed by DE RHINS in a transverse valley, east of which Monts Henri d'Orléans are probably a part of it. Continuing again 110 km. eastwards from DE RHINS' route, the range of North Kara-korum was crossed by LITTLEDALE in a nameless pass, 5472 m. high, and 75 km. farther east I crossed it in 1901 in a nameless pass of 5236 m. Interrupted by my lake of 4972 m. it was, east of the latter and south

¹ On Colonel H. BYSTRÖM's General Map of the Kara-korum Glaciers, accompanying this work, the original, incorrect altitude of Teram-kangri, or 8416 m., has been inserted.

of Chib-chang-tso, traversed by BONVALOT and ROCKHILL, and still farther east it merges into the mighty Tang-la system. Much of the deduction given above is conjectural, but still it seems very probable that the Kara-korum Pass is situated in the same series of crustal folds as is the mountain system which in the east of Tibet is called Tang-la.

The Aghil Range which is the next fold in the series, is more difficult to determine than the Kara-korum folds. BURRARD says of it: »But little is known of the Aghil range; it was discovered by Sir Francis Younghusband, and a few of its peaks have been observed by surveyors; but its length and direction have not been determined. The position given to it on the frontispiece to Part I and its junction with the Sarikol range are conjectural. The peaks observed between the Kuen Lun and Karakoram ranges along the upper courses of the Yarkand river appear to be scattered rather than aligned, and the region seems to resemble in complexity that between the Indus and Kunar rivers.—It may be that the Kuen Lun, Aghil and Kara-korum folds have been pressed against one another; all the ranges of Tibet tend to converge at the north-western corner of the plateau, as though they were trying to escape through the neck of a bottle; once having passed the neck they separate again, but during the passage they appear to suffer from extreme compression.»¹

So much is sure; that an Aghil fold exists in the north-western corner of the Tibetan highland, and it probably continues through the whole of Central Tibet. But another matter is to determine the connection between YOUNGHUSBAND's and BURRARD's Aghil Range and the prolonged system of folds running just north of the North Kara-korum system. For instead of a continuous range or system of ranges, we come across the interruption caused by the plains of Ling-shi-tang and Aksai-chin, which in the region east of the upper Kara-kash occupies the entire space between the North Kara-korum and the Southern Kuen-lun. It is therefore only by conjecture that we may try and find a connection between the folds west and east of the plateau plains. The Aghil Range itself is crossed by the Kara-korum road and pierced by the upper Kara-kash River, though with our present knowledge it will be difficult to tell where these intersections take place. I have the impression that the Aghil Range is double even before reaching the meridional valley of the upper Kara-kash. The latitudinal valley which I followed from the Dapsang Pass eastwards in the last days of December 1907, crosses the southern range and is in its eastern part situated between both ranges. East of the uppermost Kara-kash the southern range has two peaks of respectively 6388 and 6308 m., probably measured by Indian surveyors. After the interruption of Ling-shi-tang,

¹ Sketch, p. 103.

75 km. broad, the southern range may be traced in the pass of 5367 m. which I crossed in 1906. From there it continues E.S.E., bordering to the north the basins of the lakes Tsaggar-tso and Arport-tso where it has been crossed on several lines by CAREY, WELLBY, DEASY and RAWLING. The mountain group of Largot-gangri, 6151 m., is part of it. It stretches farther in the same direction through the region explored by DEASY and RAWLING, where peaks measured by them have the moderate altitudes of 5730, 6044, 5800, 6099, 5648, 5870 and 5895 m. After an interruption of 90 km. of *terra incognita*, it is crossed by my route of 1906 in a nameless pass south of Lashung-tso, 5161 m. high. The next interruption of unknown country is 185 km. broad, after which we reach the route of DUTREUIL DE RHINS who crossed the range in a pass 5630 m. high. According to his map the range is here comparatively high, and GRECARD has called it *Monts Dutreuil de Rhins*. Some 67 km. farther east we come across LITTLEDALE's route where the *Monts Dutreuil de Rhins* seem to have come to an end. Here as well as everywhere in Tibet, we find a fold or system consisting of overlapping ranges, and as a rule it will be difficult to follow for any considerable length one and the same range. In the case of the southern Aghil Range we must move some 50 km. south to come across its continuation. We find it in a nameless pass on LITTLEDALE's route, 5897 m. high. To the W. S. W. this range has some considerable peaks, as *Monts Bonvalot* on DE RHINS' route, and *Shemar-tibo* and *Tarik-gangri* on my route (1906). To the east of his pass (5897 m.) LITTLEDALE notes on his map »Very high Snowy Mountains» at a distance of 75 km. At 90 km. east of the same pass I crossed (1901) a pass of 5462 m. with mighty snow-covered peaks and short glaciers on both sides. Still 80 km. farther east is BONVALOT's route with a pass 5750 m. high. Between this pass and my pass of 5462 m. he has his *Monts Dupleix*, a high snowy range on which he has marked: »Pics de 8000 m.», which is certainly exaggerated.

Then follows again an interruption of 183 km. of unknown country until we reach ROCKHILL's route of 1891—92, and then a space of 75 km. to PRSHEVALSKIY's and A—K—'s routes, 1880. Between ROCKHILL and the latter is the range of *Buka-magnai* which also runs between the *Toktomai-ulan-muren* and another tributary to the *Mur-usu*.

East of *Aksai-chin* the northern Aghil system consists of several more or less parallel and overlapping ranges. One of them runs south of *Taldat* and *Lake Aksai-chin*. Another range, south of it, I crossed (1908) in a pass of 5305 m., which also seems to have been used by WELLBY. The eastern continuation of this range runs as an extremely rugged and wild oversnowed ridge along the southern shore of *Lighten Lake*, and may be seen on two heliogravures of this volume, and on the panoramas opposite p. 40 of Vol. IV, as well as on the panoramas 31A and 32A of my *Atlas of Tibetan panoramas*. This range probably continues to the N. E.,

being parallel to the Southern Kwen-lun. South of it another range, more or less interrupted, runs parallel to it and north of Pool-tso and Antelope plain. The latitudinal valley of Antelope plain and its N. E. continuation, where I travelled on nearly horizontal ground in 1906, is bordered to the south by a range which obviously is in connection with RAWLING's Deasy Group, 5971 m. high. In their eastern prolongation these ranges are no doubt parallel to the main axis of the Kwen-lun system and to the latitudinal valley in which WELLBY and MALCOLM travelled.

The next range of the Northern Aghil system was crossed by RAWLING S. E. of his Lake Markham and by me 57 km. farther E. N. E. in a pass of 5611 m. As RAWLING's peaks are here only 5300—5500 m. high, the range seems to increase in altitude to the east.

Then follows a gap of 275 km. of unknown country before we reach the part of the same system where it was crossed by DE RHINS in his *Passe du Chasseur*, 5362 m. high, a range that is probably overlapped by the previous one, unless there are others between them. Only 13 km. farther east this range was crossed by LITTLEDALE at an altitude of 5072 m.; 43 km. east of LITTLEDALE I traversed it in a pass of 5056 m., and still 110 km. eastwards in a transverse valley where the altitude was 4997 m. East of this valley it is called *Chaine des Volcans* by BONVALOT who 48 km. farther east crossed it in a pass of 5200 m. East of his route BONVALOT calls it *Chaine Van der Putt* which, however, seems to overlap the previous one. This range runs north of my group of three lakes (1900). It is certainly in connection with the Dungbure system which farther east was crossed by ROCKHILL, PRSHEVALSKIY and A—K—.

On his frontispiece map BURRARD has sketched the Kwen-lun as one mighty range running north of the upper, latitudinal courses of the Yarkand-darya and Kara-kash-darya, and being in immediate connection with the meridional Kashgar Range. At about 81° East Long. the range bifurcates, and at 83° the northern, principal branch again bifurcates, the northern branch being the Altyn-tagh Range, and the southern the Kwen-lun proper.

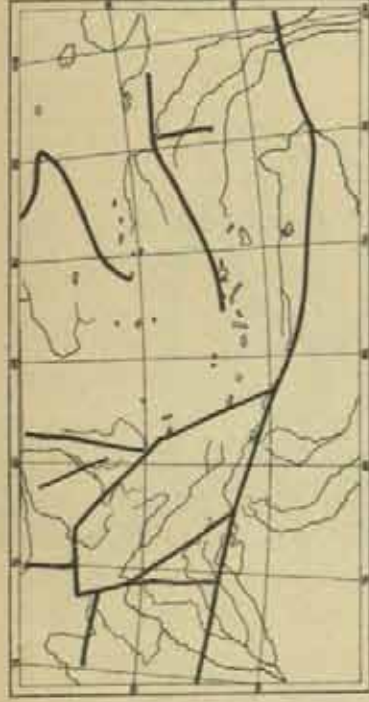
The Western Kwen-lun no doubt consists of two main and several smaller ranges, all parallel with one another. The southern of these, the Raskem or Raskan Range, runs north of and parallel to the upper Raskem-darya. Its best known pass is the Chirak-saldi-davan, 3970 m. high. The E. S. E. continuation of this range may be called the Suget Range as it is crossed in Suget-davan, 5434 m. high. The knee of the sharp eastward bend of the upper Karakash where STEIN has travelled in several directions, pierces the range. East of this bend the range rises to very considerable dimensions, and has many peaks and crests with eternal snow and glaciers. One of the highest peaks is Chelpanglik, 7104 m. high. Then

the stretching becomes easterly. In the region where the Yurun-kash has its sources on the northern slopes of this range, CAREY and DALGLEISH, GROMBTCHEVSKIY, members of PIEVTSOFF's expedition, DE RHINS, DEASY and STEIN have travelled.

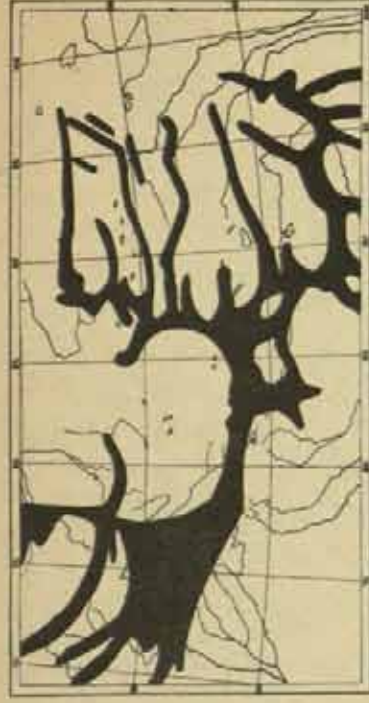
In the eastern part of this Southern Kwen-lun Range there are peaks of 6920, 6352, 6410, and 6085 m. Two of them are called Chong-mus-tagh and Koramlik-tupe. East of this region is *terra incognita*, and the largest unknown space still remaining on the map of Tibet, 390 km. in length, where the great plateau has not been crossed by a single traveller's route. However, I feel persuaded that the main axis of the Kwen-lun system, or the highest range of the system which we have called the Southern Kwen-lun, continues through the whole space, and is in uninterrupted connection with the Arka-tagh. For west of the unknown space we have the mighty Southern Kwen-lun system, and east of it are the no less powerful ranges of Arka-tagh, both systems with the same characteristic features; with eternal snows and glaciers. It may therefore be regarded as extremely unlikely that there should not be a connection of the same kind between the two. This system of crustal folds stretching through the whole of Tibet from west to east is one of the most magnificent orographical features of the whole country, and plays the same part in the north as the Great Himalaya in the south. As the Yurun-kash and Keriya-darya have their sources on the northern side of the Southern Kwen-lun, and the Cherchen-darya, Chulak-akkan and rivers going to Achik-kul and Ayagh-kum-kul take their origin from the northern slopes of the Arka-tagh, it may be regarded as nearly certain that the sources of the Tolan-khoja, Bostan-tograk, Mölja, and Kara-muran are situated on the northern slopes of that part of the range which is still unknown.

The Arka-tagh I found to consist of four parallel ranges with the following average altitudes from north to south: 5021 m., 5193 m., 5210 m., and 5262 m. They consequently increase in altitude to the south. Along the southern base of the system runs the great latitudinal valley which I followed in 1896, and which probably continues the whole way westwards to Lighten Lake and the Lake of Aksai-chin, as described in Chapter LX above.

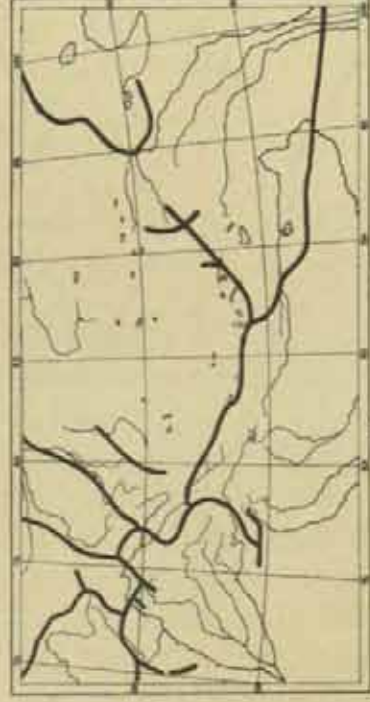
The Southern Kwen-lun is double and it obviously expands on its way eastwards where four ranges are easily discernible. The great unknown patch in Northern Tibet is bordered to the east by my route from Kara-muran to Arka-tagh in 1896, and, north of Lac de l'Antilope, by the routes of DE RHINS and LITLEDAL. On their meridional routes the two latter explorers have crossed a series of Arka-tagh passes, *viz.*, a pass west of Ulug-sai, 5230 m. high, two passes in the Kosh-tagh Range north of the upper Kara-muran (Mong. muren) having the altitudes of 5250 m. (de Rhins) and 5370 m. (Littledale). In the next range follows a pass called North Kara-muren-davan, 5436 m. high, where Littledale notes to the east »Large Snow-fields and Glaciers», which obviously is the mighty mass of Ulug-mus-tagh, 7360 m.



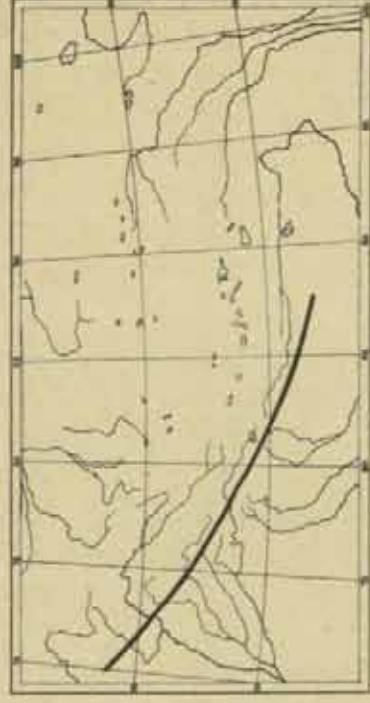
PTOLEMAEUS ROMÆ 1490.



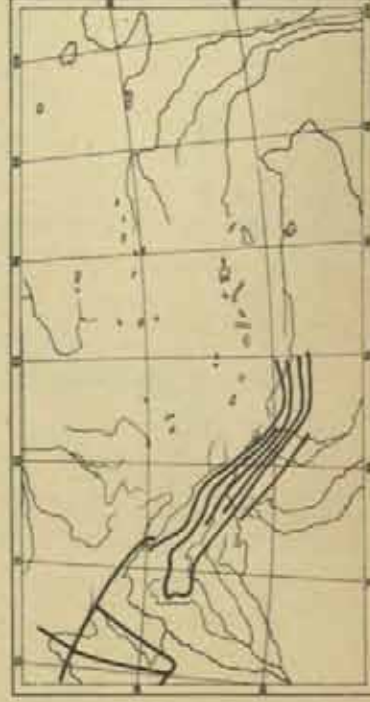
GASTALDI 1561.



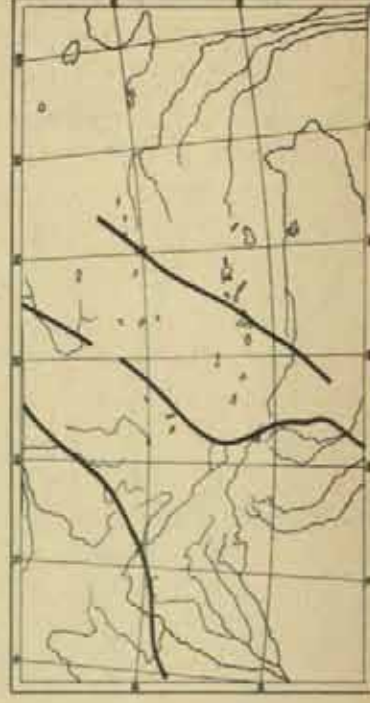
MERCATOR 1569.



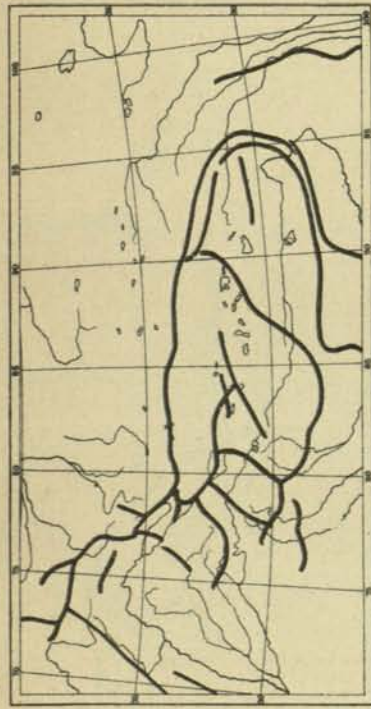
ORTELIUS 1570.



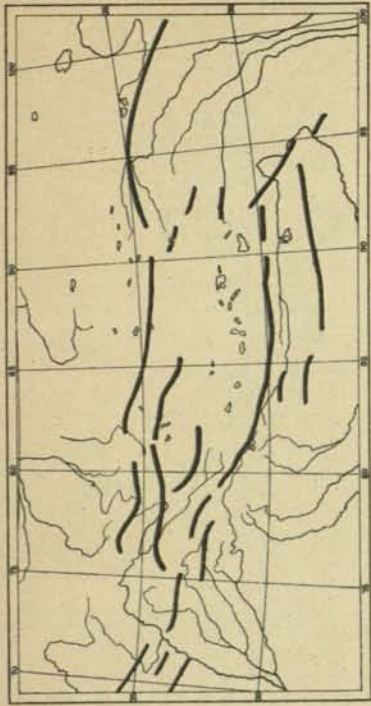
MONSERRATE 1582.



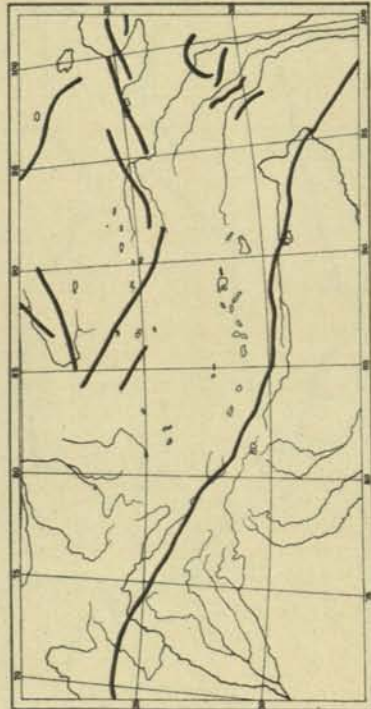
JANSSONIUS 1641.



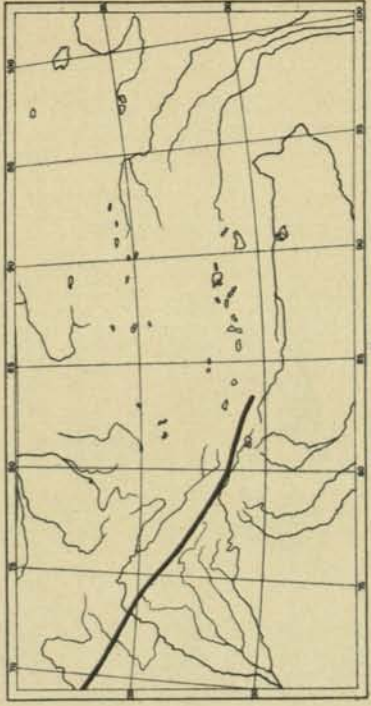
SANSON D'ABBEVILLE 1654.



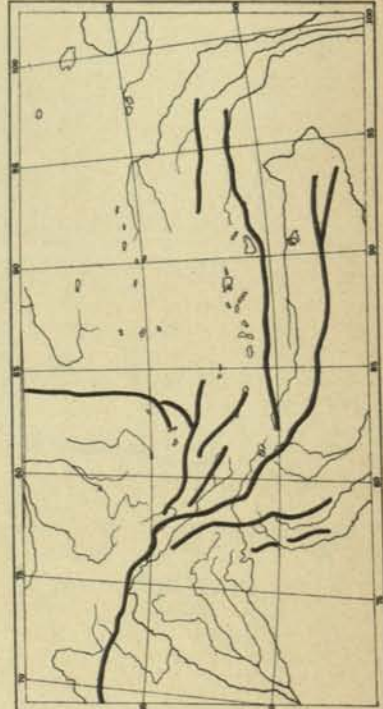
KIRCHER 1667,



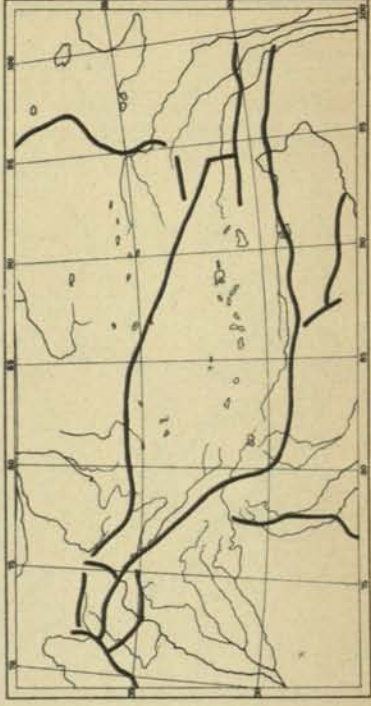
CORONELLI 1695.



ISBRANTS IDES 1704.



DELISLE 1705.



DELISLE 1723.



STRAHLENBERG 1730.



D'ANVILLE 1733.



Dow 1768.



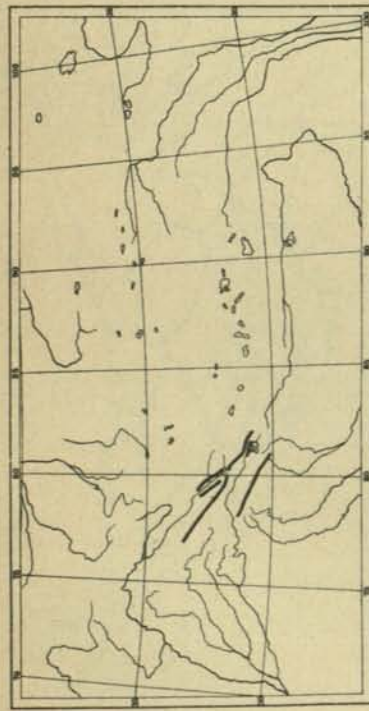
RENNELL 1783.



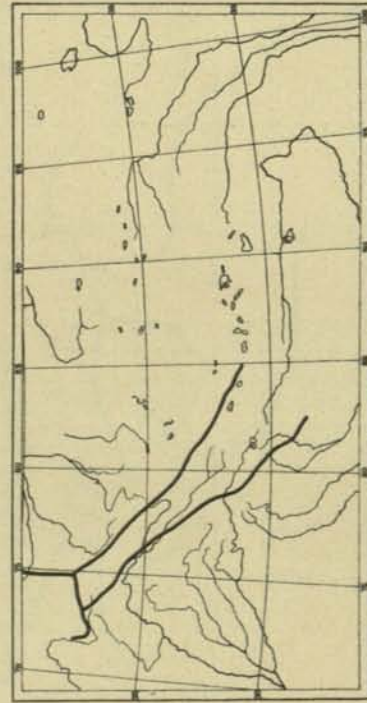
RENNELL 1788.



ARROWSMITH 1801.



MOOCROFT 1812.

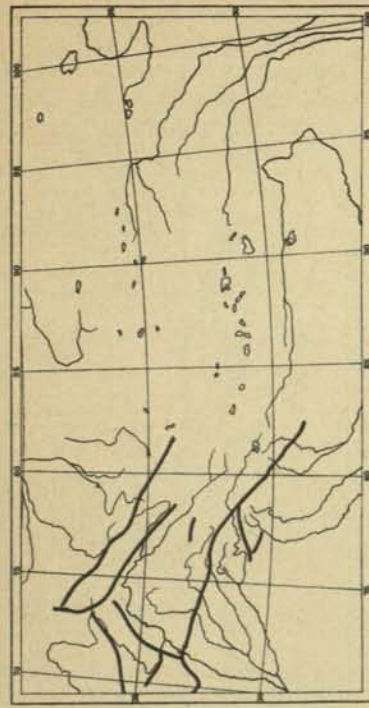


ARROWSMITH 1816.



MURRAY 1820.

GEORGE WALLACE & SONS



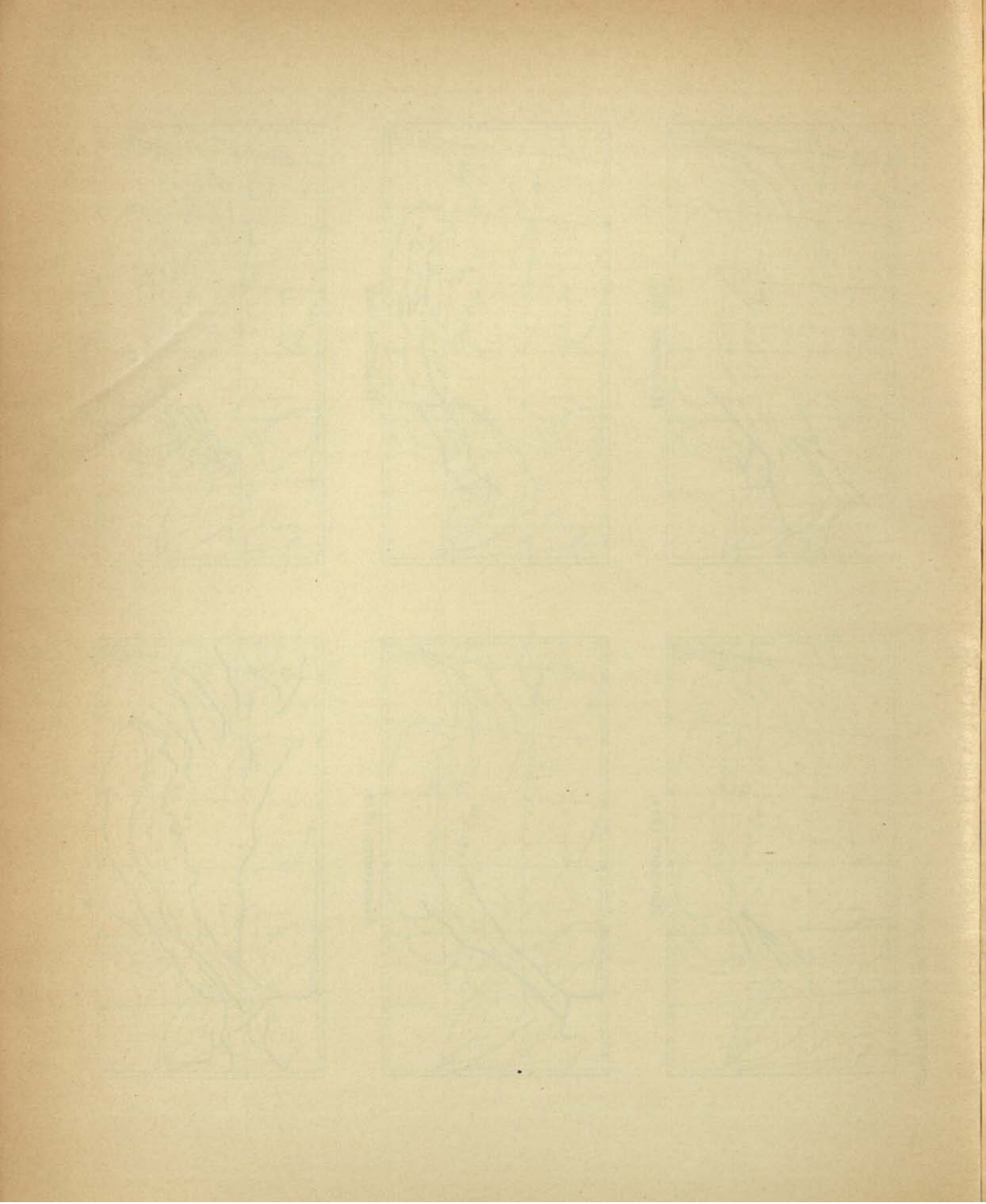
MACARTNEY 1815.

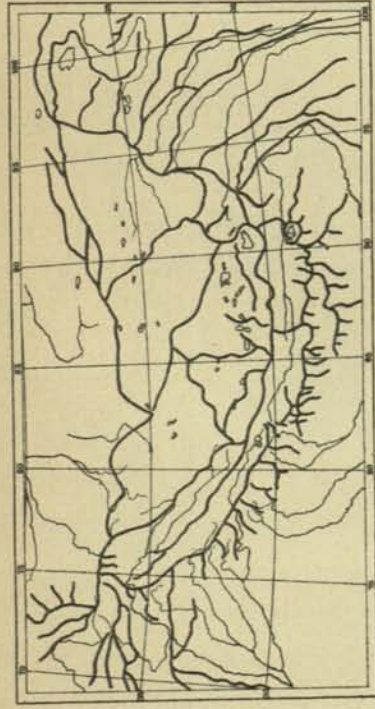


HAMILTON 1819.

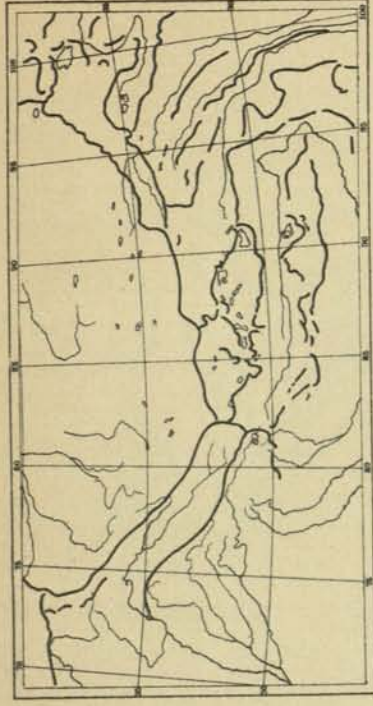


ALEX. GERARD 1821.

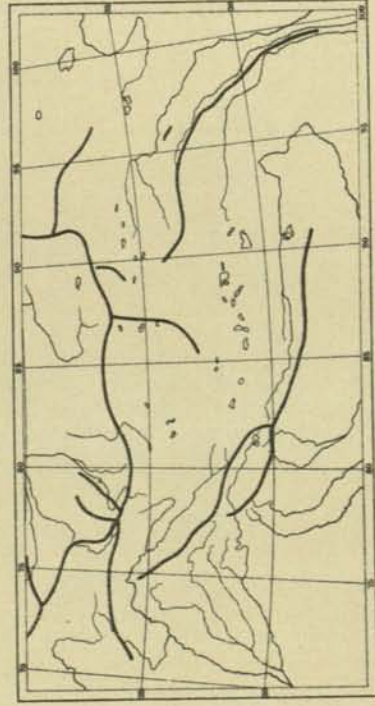




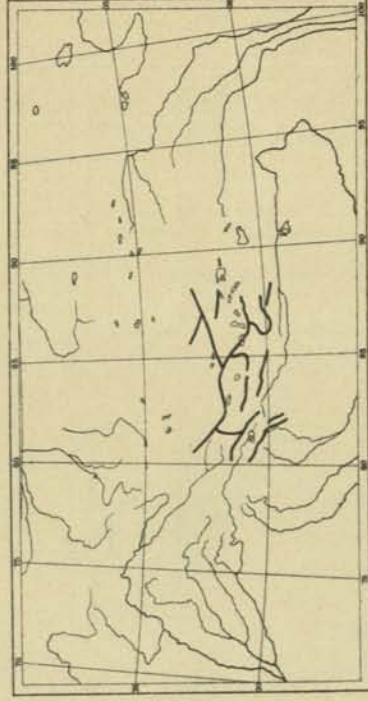
LAPIE 1824.



STIELER 1826.



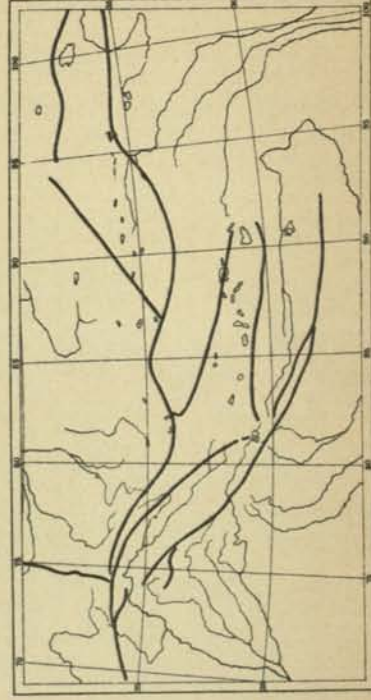
KLAPROTH 1826.



VANDERMAELEN 1827.



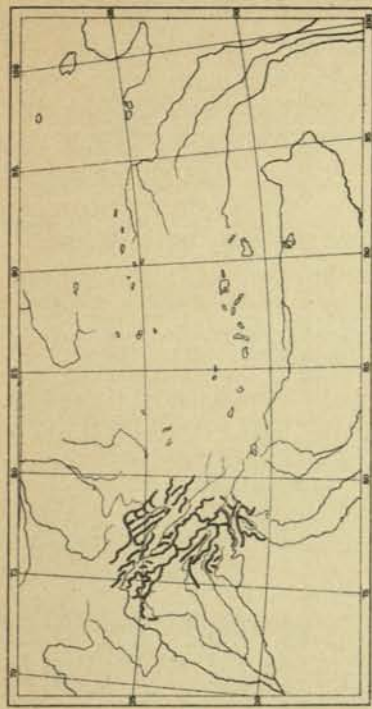
ITTER AND GRIMM 1828.



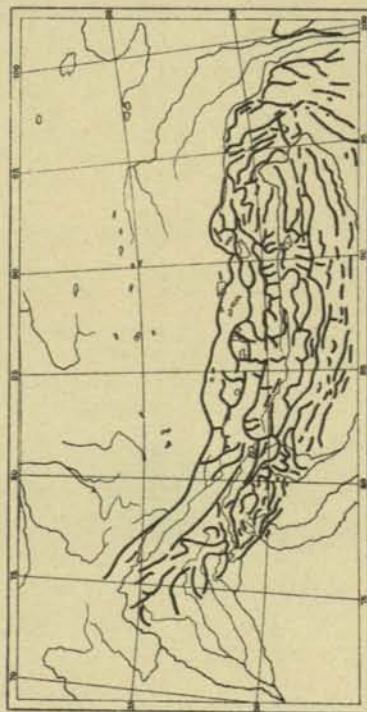
HUMBOLDT 1830.



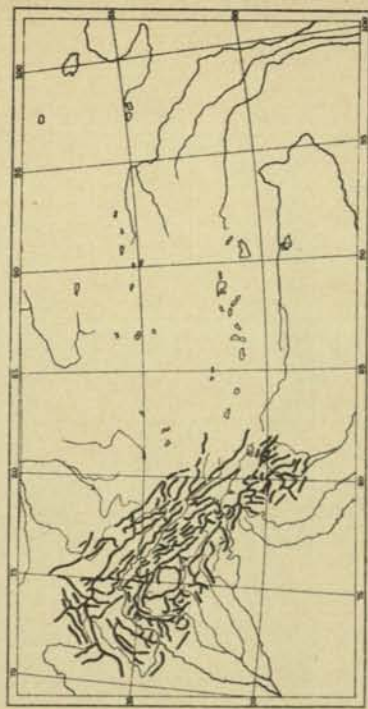
HÜGEL — J. ARROWSMITH 1847.



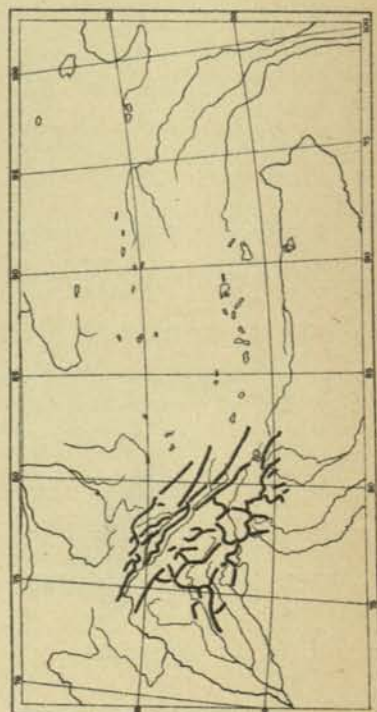
THOMSON 1848.



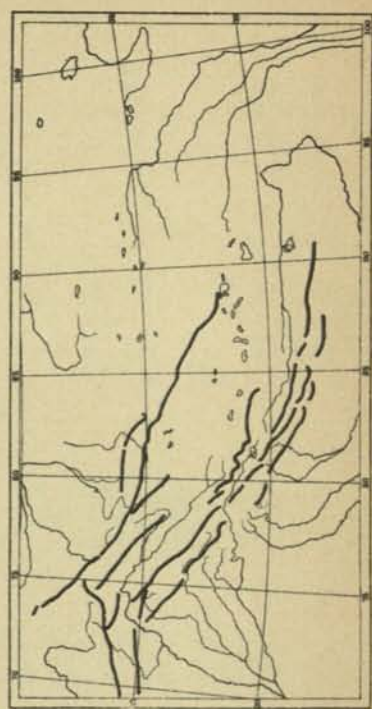
STIELER 1849.



H. STRACHEY 1853.



WALKER 1854.



SAINT-MARTIN 1857.



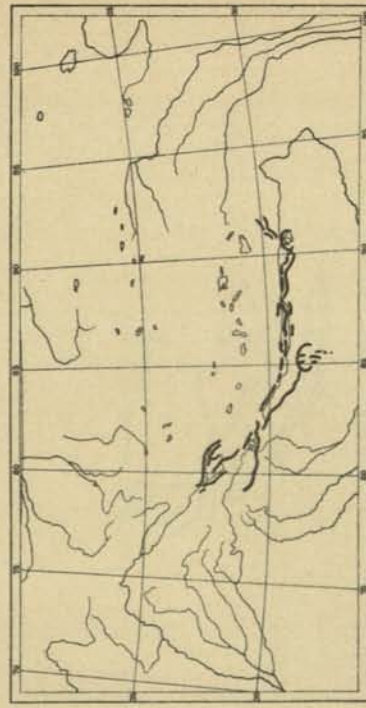
HODGSON 1857.



SCHLAGINTWEIT 1861.



JOHNSON 1865.



NAIN SING 1867.



HAYWARD 1869.



FORSYTH 1870.



SHAW 1871.



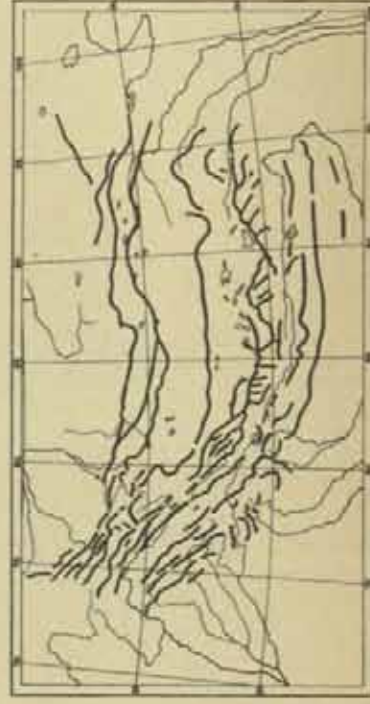
TROTTER 1874.



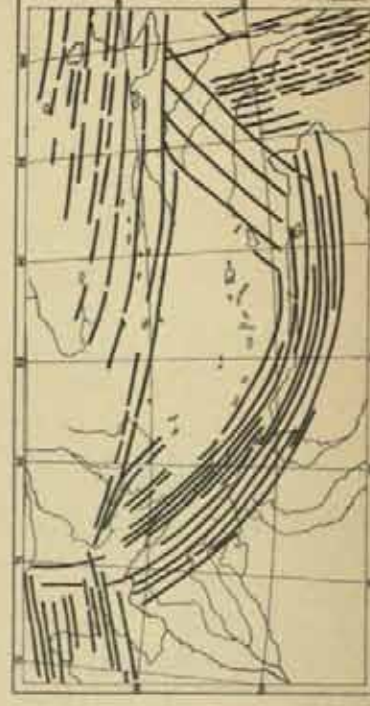
NAIN SING 1874.



MILITÄR GEOGRAPH. INSTITUT, WIEN 1873.



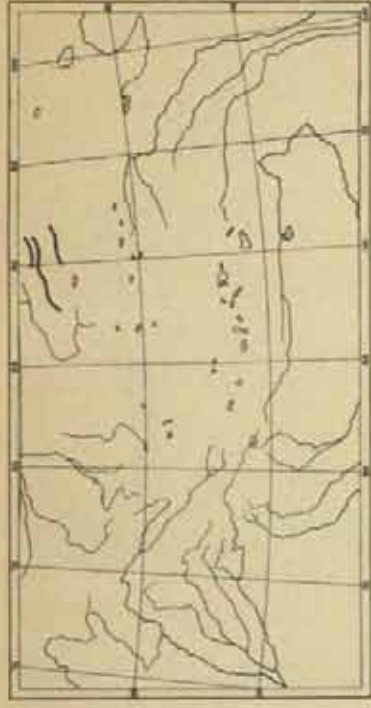
PETERMANN 1875.



RICHTHOFEN 1877.



SAUNDERS 1877.



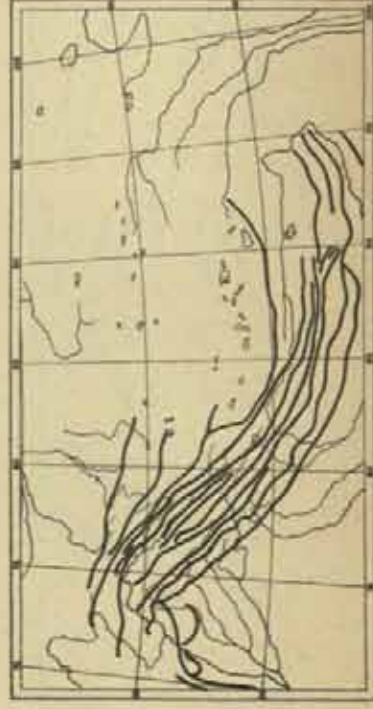
PRZHEVALSKIY 1877.



PRZHEVALSKIY 1880.



RECLUS 1883.



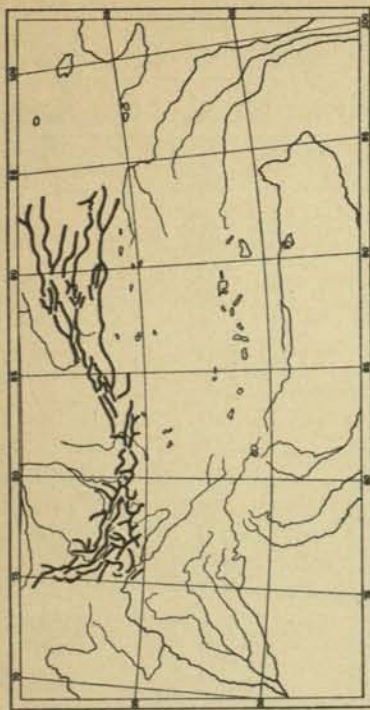
GODWIN-AUSTEN 1883.



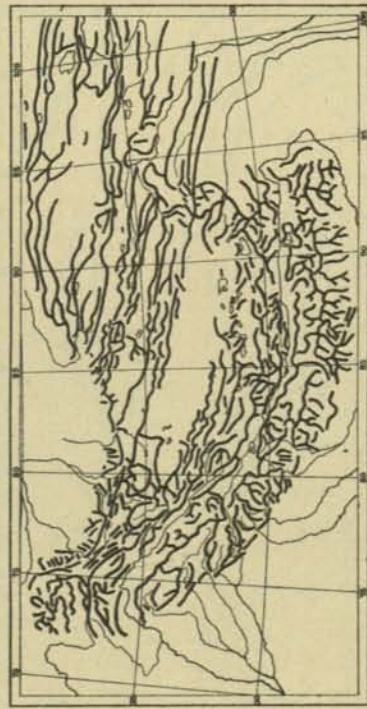
CAREY AND DALGLEISH 1885.



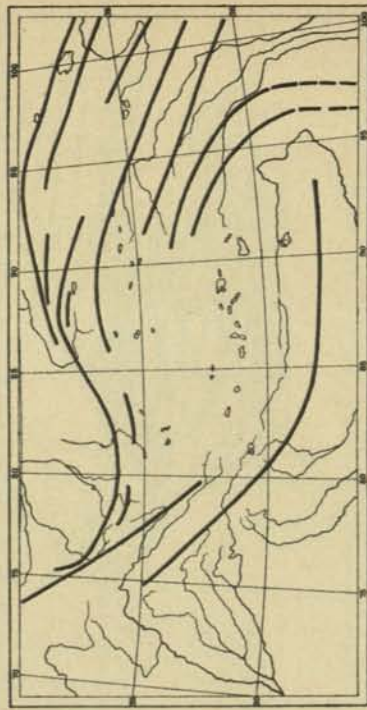
BONVALOT 1890.



PEVTSOFF 1890.



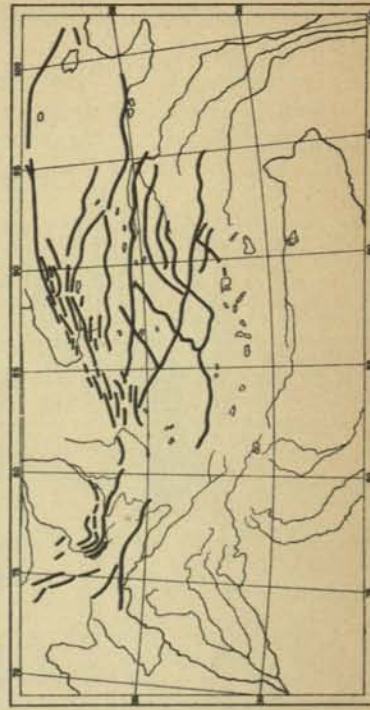
WEGENER 1891.



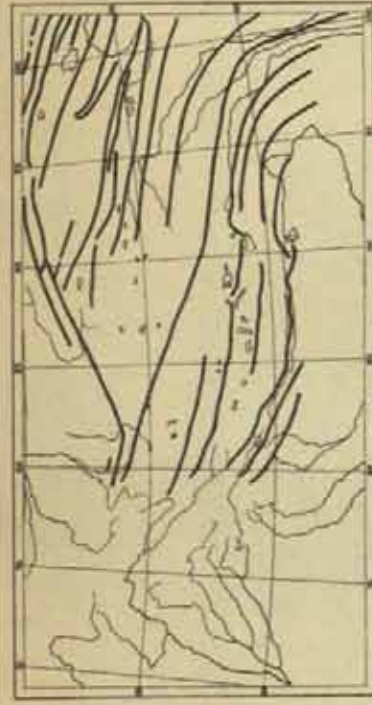
BOGDANOVITCH 1891.



BOGDANOVITCH 1891.



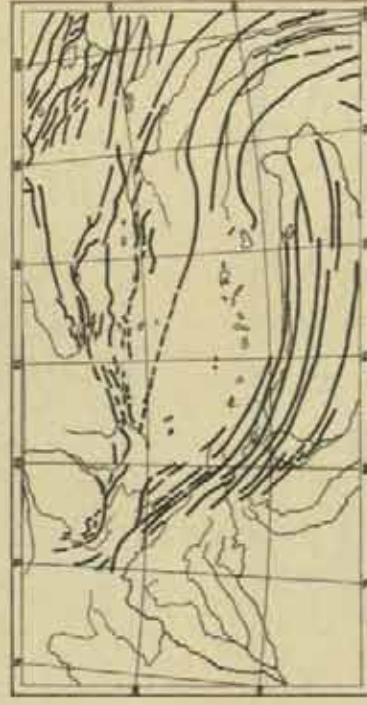
BOGDANOVITCH 1891.



Lóczy 1893.



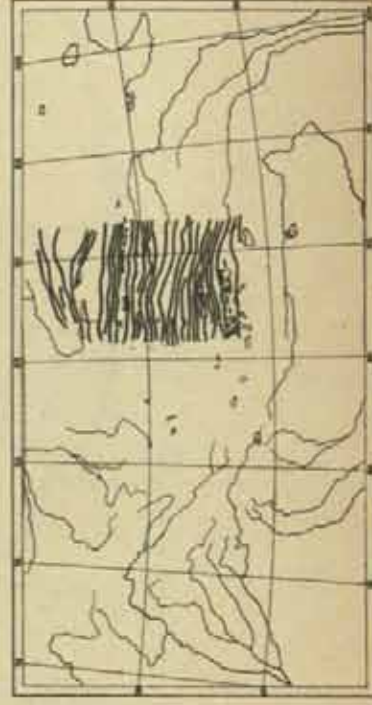
Obkucheff 1893.



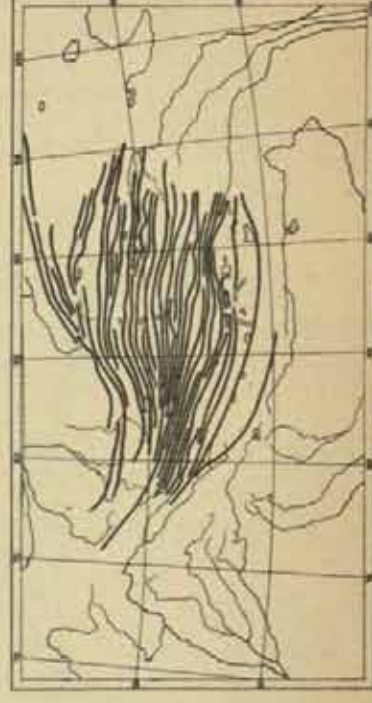
Futterer 1896.



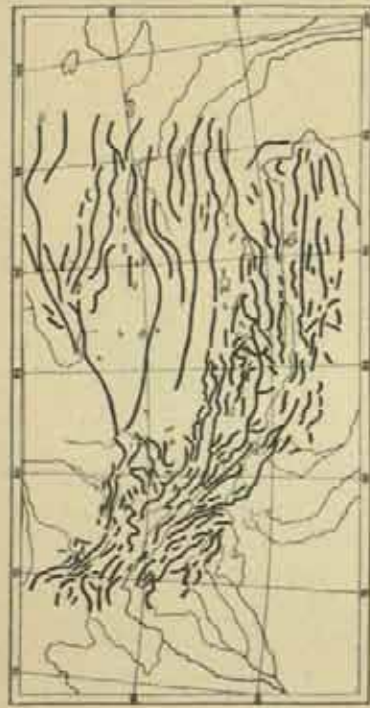
Grenard 1899.



Sven Hedin 1901.

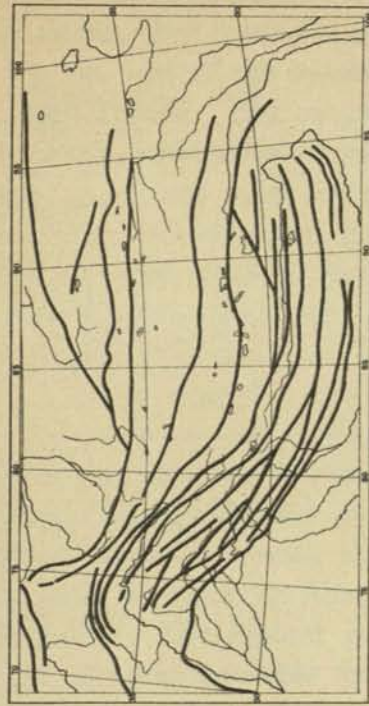


Sven Hedin 1901.

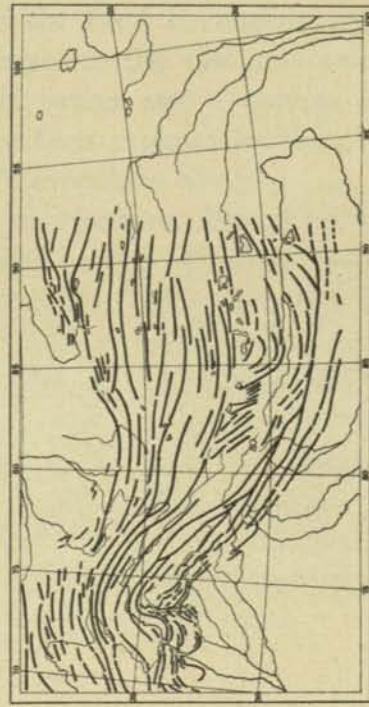




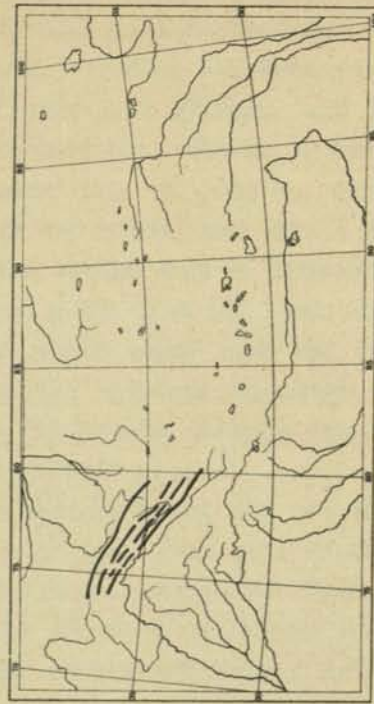
ROYAL GEOGR. SOCIETY 1906
(THE SHADED REGIONS = UNEXPLORED)



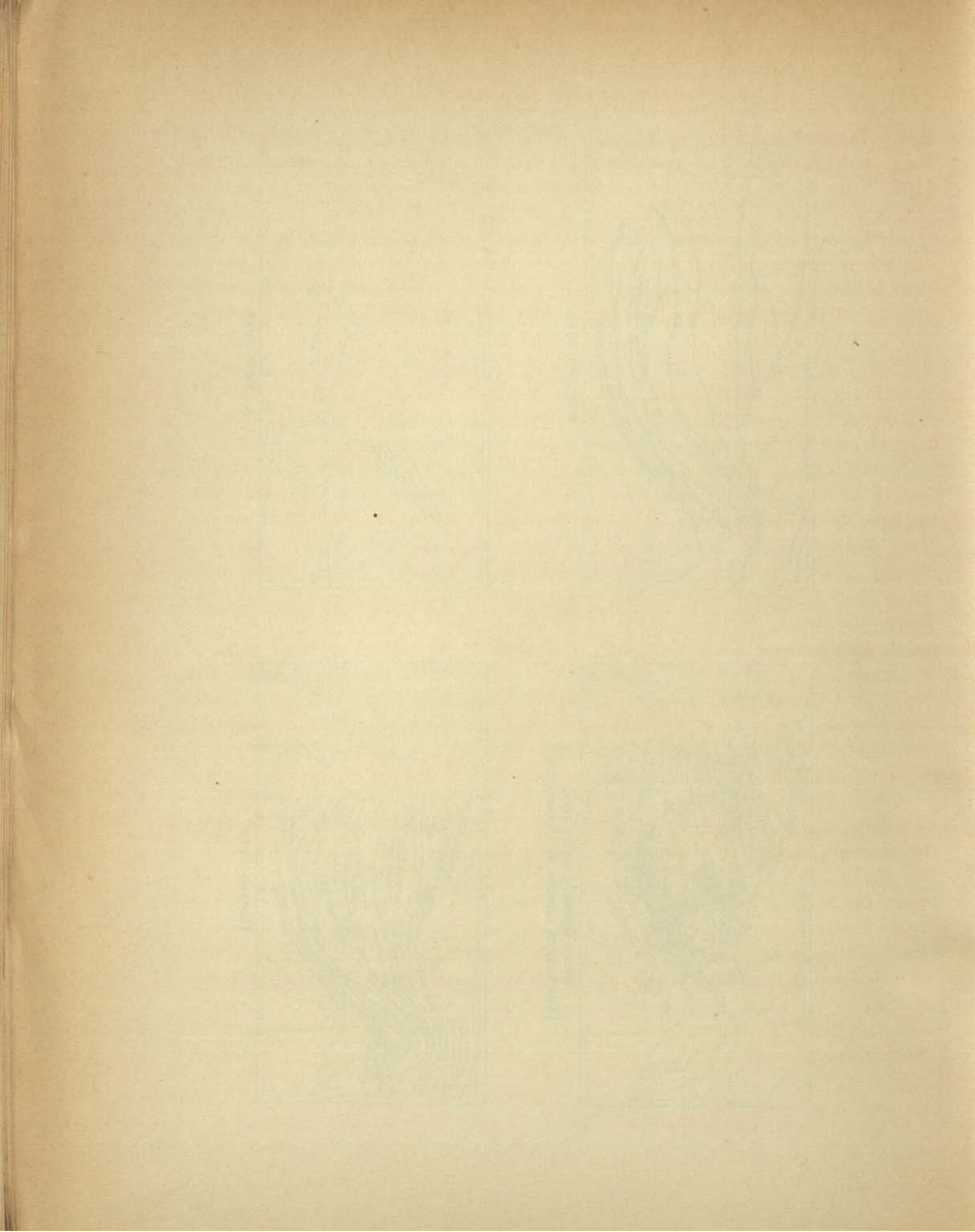
BURRARD 1907.



OSWALD 1909.



A. NEVE 1910.



high. The next Arka-tagh range to the south, situated south of another branch of the upper Kara-muran, they crossed in a pass called South Kara-muren-davan, 5570 m. high. Some 17 km. east of the last-mentioned pass I crossed the same range in a pass 5521 m. high (1896). This range is full of snow and glaciers, and probably constitutes the direct continuation of the Southern Kwen-lun. About 75 km. farther east is my next meridional route with three passes, two of 5203 m., and one of 4964 m. Another 70 km. eastwards is also one of my routes, and here I traversed only one Arka-tagh pass, 5091 m. high. Sixty km. farther east is Bonvalot's route with his *Passe du Requiem* about 5050 m. high, and south of it his *Passe du Grand Lac*, 5450 m. Another, 70 km. eastwards, is my fourth route with the passes of 5130, 5122, 5111, and 5106 m. Still farther east the Northern Arka-tagh is called Bokalik-tagh. To the latter Prshevalskiy's *Shapka Monomakha* (Monk's cap) belongs. East of Lake XX I crossed the Bokalik-tagh in a pass of 4939 m.

South of my latitudinal valley and north of WELLBY's are the two Koko-shili Ranges for which I found the mean altitudes of 5138 and 5102 m. I crossed them on three lines, while Bonvalot, de Rhins and Littledale have traversed them once in three different passes. The highest pass is to be found in de Rhins' *Montagnes Rouges*, 5400 m. It seems probable that both these ranges are crossed farther west by Wellby's latitudinal valleys, and that my passes of 5207 and 5611 m. (1906) are situated on them.

The Northern Kwen-lun Range is situated in the sharp westward bend of the Kara-kash by which it is pierced. West of the bend it continues N. W. and seems to be in connection with the Kashgar Range, to the east it is called Ulug-tagh between Yurun-kash and Keriya-darya. Still farther east it spreads fanlike in several gradually diverging folds which chiefly have been explored by ROBOROVSKIY, KOSLOFF and BOGDANOVITCH, during PIEVTSOFF's expedition of 1889-90. On my road from Cherchen *via* Kapa and Dalai-kurgan to Northern Tibet I crossed them in 1896. Many of these ranges have special Turki names, of which Tokus-davan is the best known. The eastern part of North Kwen-lun I have described in *Scientific Results*, Vol. IV, p. 537 et seq; the map opposite p. 564 of the same volume shows the situation of the different ranges. The principal ranges are, from north to south: Lower Astin-tagh with a mean altitude of 3028 m., Upper Astin-tagh with 3435 m., Akato-tagh with 3971 m., Chimen-tagh with 4240 m., Ara-tagh with 4375 m., and Kalta-alaghan with 4462 m. The mean altitude therefore increases southwards, as is also the case with the latitudinal valleys between these ranges. The vast basin of Ayagh-kum-kul and Achik-kul forms an interruption between the North Kwen-lun or Astin-tagh, and the South Kwen-lun or Arka-tagh.

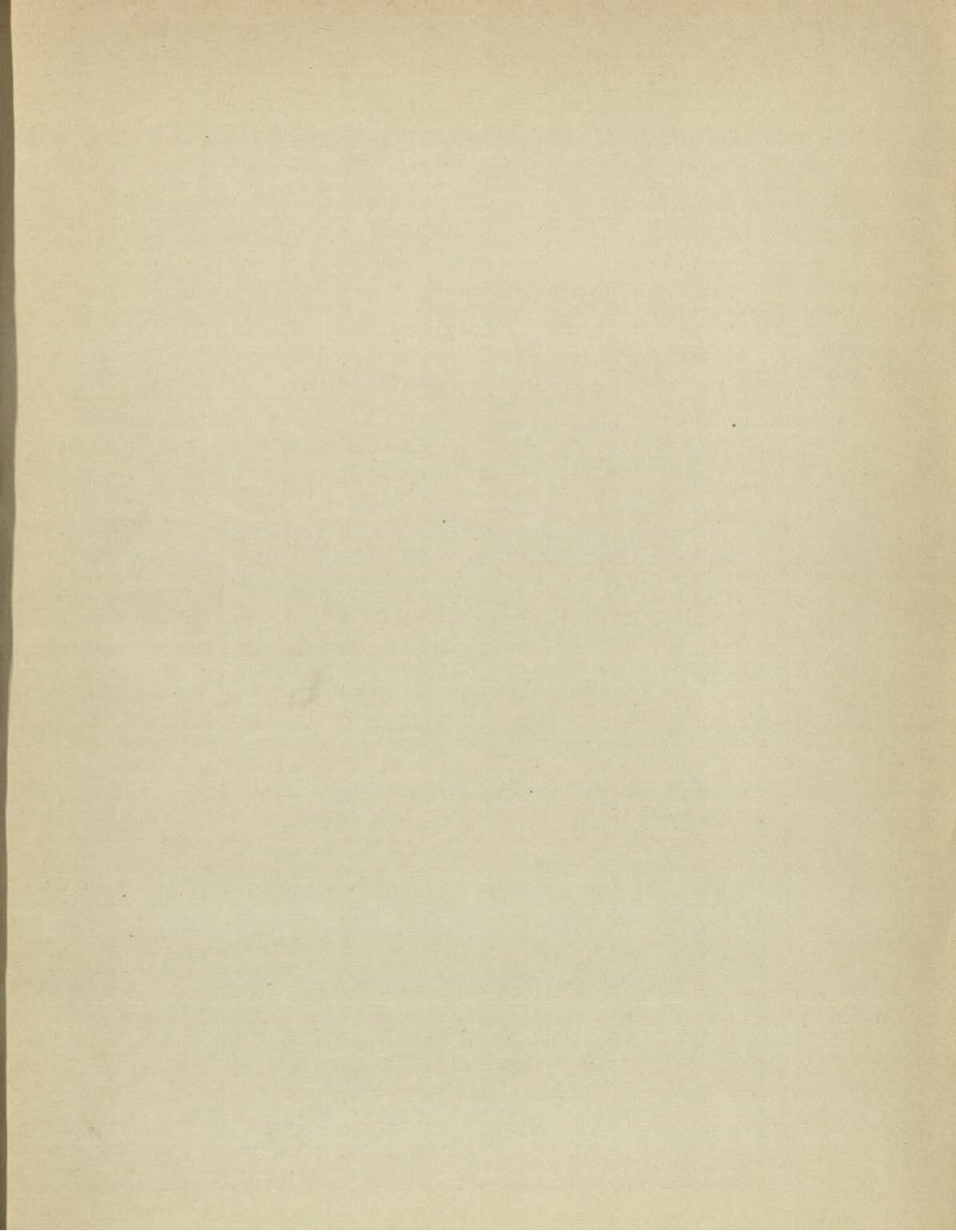
CHAPTER LXIII.

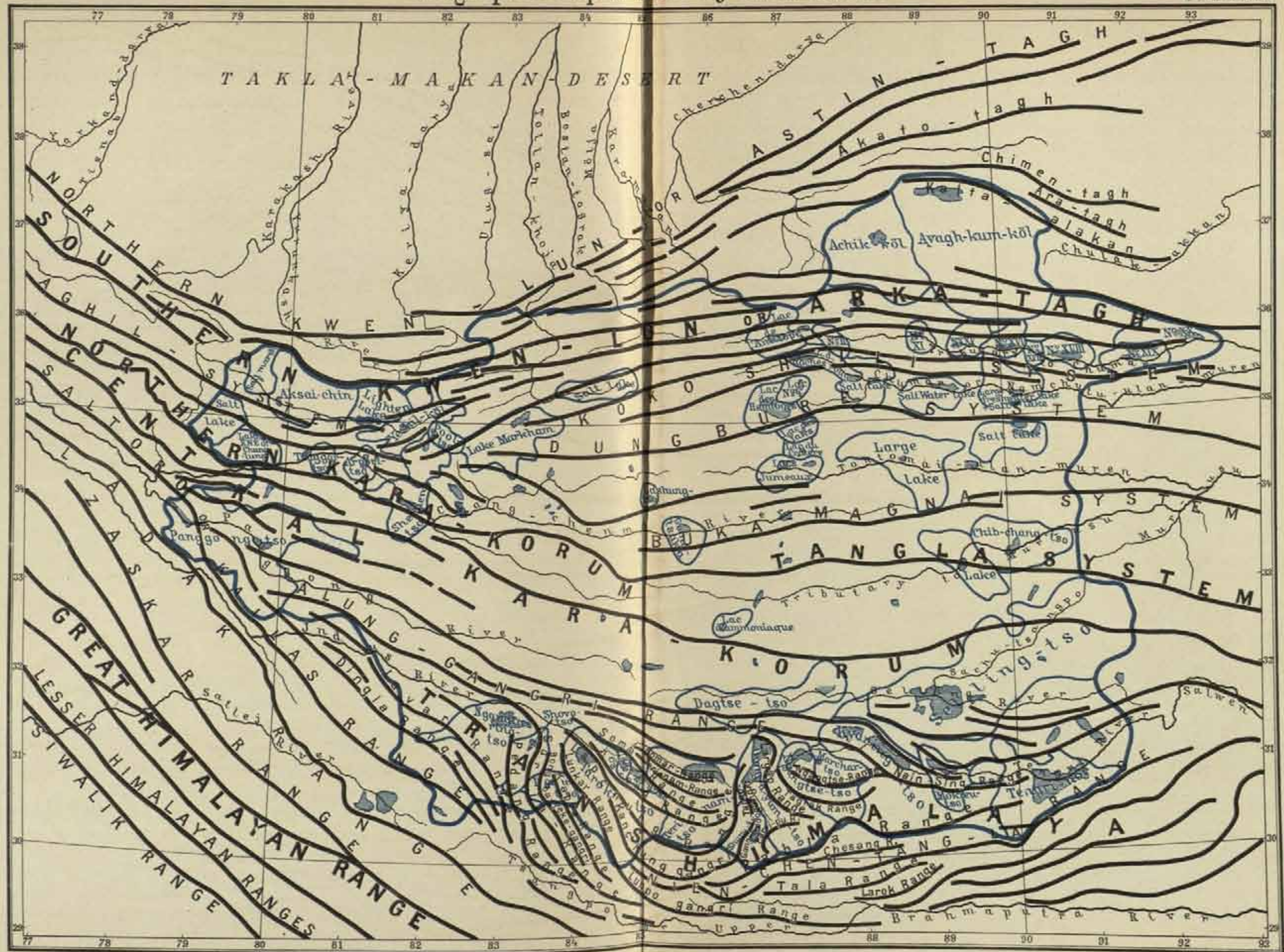
RECAPITULATION OF THE OROGRAPHY AND MORPHOLOGY OF TIBET.

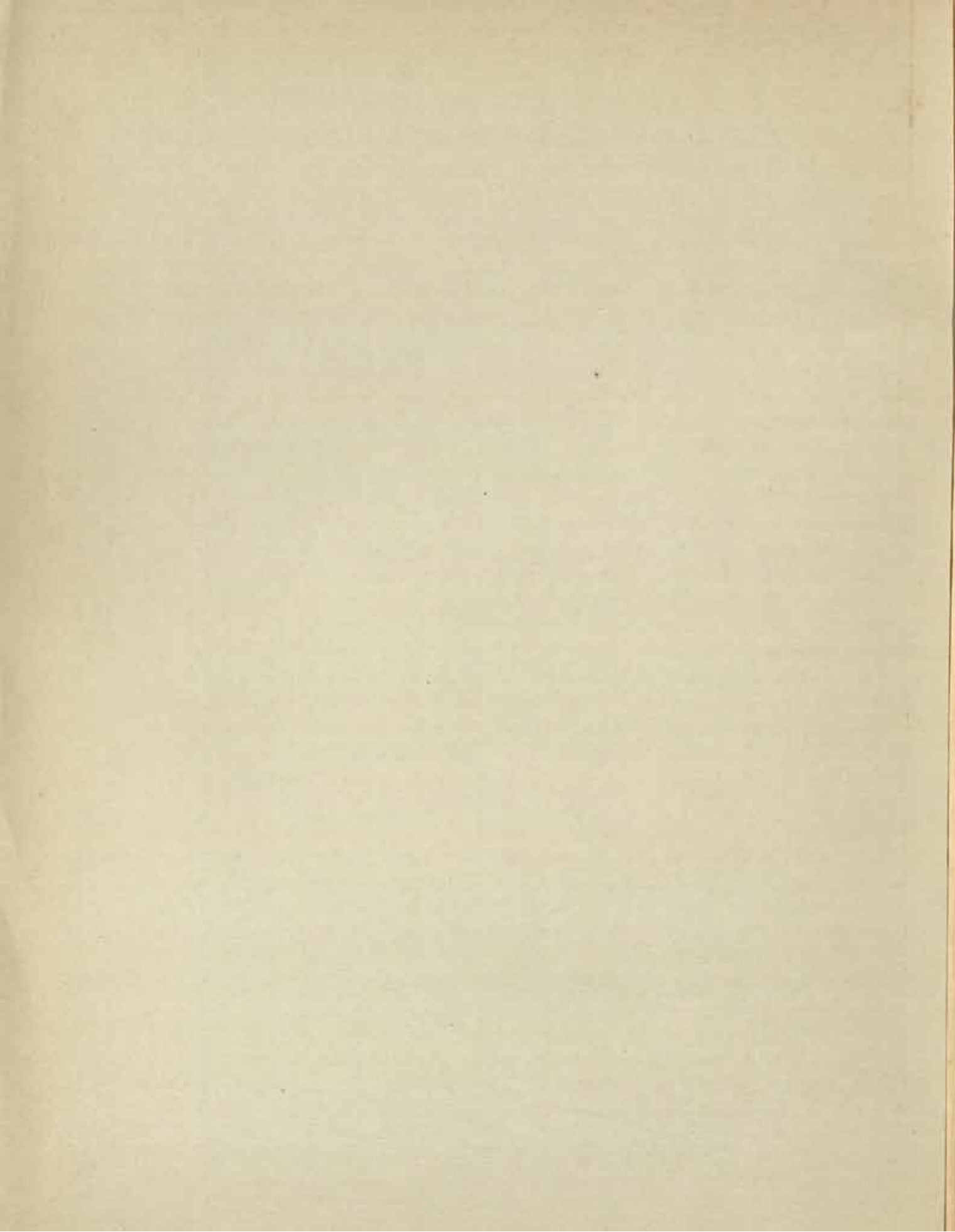
In Vol. I, II, III and VII of the present work I have dealt with the geography of Tibet from a historical point of view. I have done my best not to forget or overlook a single traveller or scholar from the remotest times to our own days. Even if not absolutely complete, the material brought together will, I hope, be sufficient to give the student a fairly clear idea of the slow and successive development of our knowledge of the general geography and principal orographical features of this country.

As a résumé or a kind of cartographical index to the history of exploration in Tibet, especially from an orographical point of view, I have, on the accompanying 80 small sketches (Pl. LXXV—LXXXVIII), drawn the principal mountain ranges as they were supposed to run by geographers and explorers of different epochs, all the way from Ptolemæus Romæ, 1490, to Neve, 1910. The maps speak clearly enough for themselves without a text that would only be a reiteration of what has already been said. While the history of Asiatic maps in Europe may be regarded only as embracing five centuries, the cartographical history of the Chinese, as is set forth by Dr. ALBERT HERRMANN in Vol. VIII of this work, embraces 3000 years and more. It is, however, interesting to follow step by step through the centuries the difficult and arduous struggle for knowledge of this remote and inaccessible world of mountains which finally has brought us so far as is shown on the map in 1:1000000 accompanying this work.

After having examined the 80 small orographical maps, the reader will have to direct his attention to Pl. LXXXIX which may be said to be the next step after the maps of BURRARD and NEVE. It is a reproduction of the large map in 1:1000000, and therefore may be said to contain all the principal mountains known to exist in Tibet. As has been described in the preceding chapters, I have made an attempt to follow the alignments of the principal ranges which, on the map (Pl. LXXXIX), have been drawn in thick, black lines. In the west the ranges, as







conceived by BURRARD and NEVE, will be easily recognized. In the north we find the Kwen-lun Ranges as they were surveyed chiefly by Russian and later on by a few other travellers. A very great portion of the interior of the Tibetan highland is filled up by the Northern and Central Kara-korum Ranges, the first no doubt in connection with the Tang-la system, the second also continuing far to the east. The most striking new feature of my map is the eastern prolongation of the Saltoro or Kailas Range, *viz.*, the Central Transhimalaya, a very broad and complicated system, of which, before my last journey, only a few border ranges and peaks had been seen from a distance. It may be regarded as perfectly certain that the Kara-korum Ranges as we know them in the west diverge E. S. E. and eastwards, and that their continuations cover the whole southern half of Tibet between the Tang-la and the Transhimalaya. A difficult question, which will demand a very thorough and detailed examination in the future, is the way in which the different Kara-korum Ranges run in the region of, and particularly north of, Panggong-tso. For this region seems to be nearly as complicated as the mountains pierced by the middle courses of the Indo-Chinese rivers. Therefore it is superfluous to say that my map (Pl. LXXXIX) is only a new attempt to bring order into the mountain ranges of the highest protuberance of the solid surface of the earth.

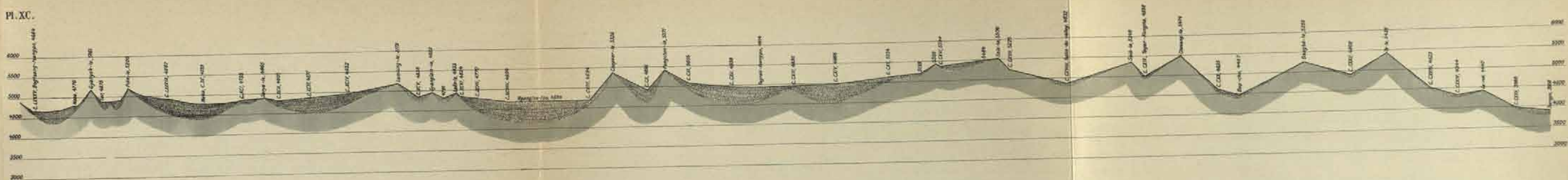
In connection with the orography a few words should be said regarding the general levelling of mountains and depressions that has given rise to the present morphology of the great plateau of Tibet. By the orogenetic folding activity which was at work during the whole Tertiary epoch the chief features of the fold-troughs between the mountain ranges were formed. The very lively atmospheric activity which took place during and after the same enormously long period, gave rise to the precipitation and consequently to the rivers which cut down and excavated the folding troughs deeper and deeper, and pierced the mountains in wild, narrow gorges. This state of things prevailed all over Tibet. The whole country presented the same accentuated sculpture, the same deep-cut valleys between steep or nearly perpendicular mountains as still are found in the wildest and most inaccessible parts of the Himalayas. As compared with the latitudinal valleys the mountain ranges were gigantic, running uninterruptedly through the whole of the country. The gorges were filled with rivers forming rapids and water-falls and joining the main rivers in the latitudinal valleys which all were bound to the ocean or to the interior of the continent. All the debris and the detritus from the mountains and river-beds was carried away by running water.

From cosmic or terrestrial reasons the climate became dry and the precipitation diminished gradually. Therefore, and in connection with the differential movements of the crust, the upper courses of the rivers were cut off, and increasing areas of the highlands were transformed into self-contained basins. The denudation

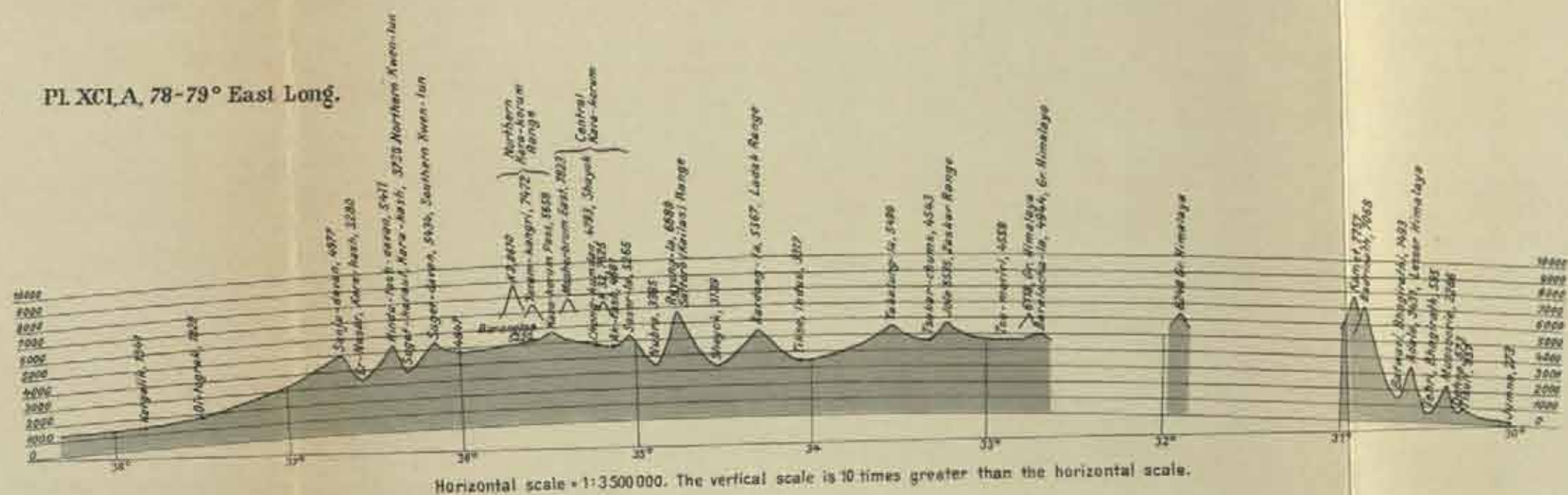
went on, debris and detritus were washed down by temporary and occasional rains and melting snows, as well as by winds, into the lowest parts of the depressions. The relative altitudes of the mountains decreased, the wild accentuated forms were smoothed and rounded at the same time as the valleys, and the basins became broader, shallower and more even. The steepness of the gradients all over the country diminished gradually and coincidentally with the decreasing differences in altitude between the mountains and the depressions. The enormous beds of subaerial deposits in the region of the Upper Satlej prove that an epoch of great aridity prevailed before a period of moist climate with heavy precipitation again set in. The latter was followed by a new period of aridity which still goes on, though the present area of self-contained basins is less extensive than that of the earlier arid epoch. On map LXXXIX the present extension of the self-contained area of Tibet is marked with a thick, blue line, and the areas of the basins mentioned in chapter LV are indicated with thin blue lines.

On the accompanying figures (p. 589) I have sketched four successive stages in the course of development which in earlier as well as in the present period of aridity is going on in Tibet. The depressions become gradually filled with blocks, gravel, sand, dust and material in the finest state of division. By the increasing deposits the mountain-sides become more and more hidden, and only occasionally solid rock crops up from the beds of debris. Simultaneously, weathering and denudation continue on the still projecting crests. By this levelling activity the folding land is transformed into a plateau-land, the even plains of which are interrupted by rounded ranges. In some cases no doubt comparatively low ranges have already become completely embedded in the deposits. In other cases low and rather short ranges still raise their rounded crests above the surrounding plateau-land. But of course there are here and there in the interior, and more particularly near the edges of the plateau-land, magnificent mountains which still bid defiance to the destructive activity of weathering and denudation.

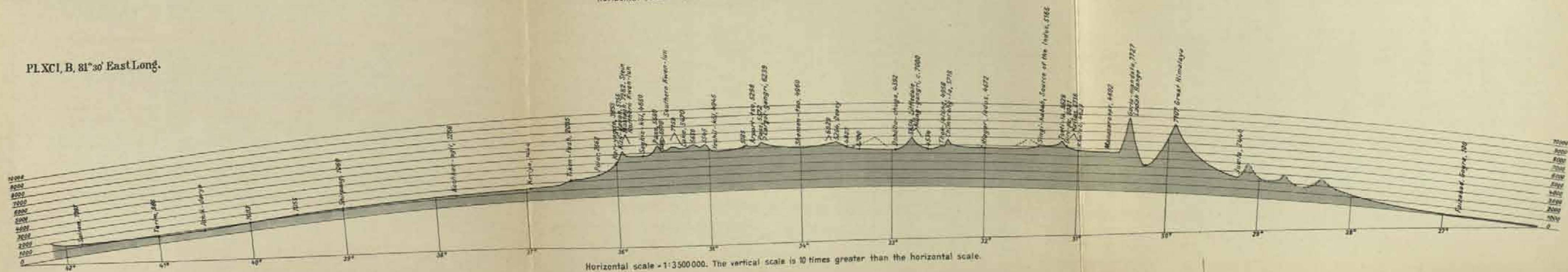
On Pl. XC I have drawn a profile of my route from Camp LXXXV on the Bogtsang-tsangpo to the Tsangpo below Camp CXXV. The vertical scale is nearly 10 times greater than the horizontal scale. The single object of this profile is to show the great morphological change which takes place in the relief and sculpture of the highlands as soon as we pass from the interior, self-contained parts of Tibet to the peripheric region with an outflow to the sea. On our profile this boundary is situated in the Sela-la. To the north of this water-parting Transhimalaya pass we meet softer forms with slowly rising gradients, and basins filled with deposits. To the south of Sela-la, on the other hand, we find an accentuated relief and deep-cut valleys where the still comparatively abundantly running water washes away all fine material, and where thus no mighty deposits may be formed.

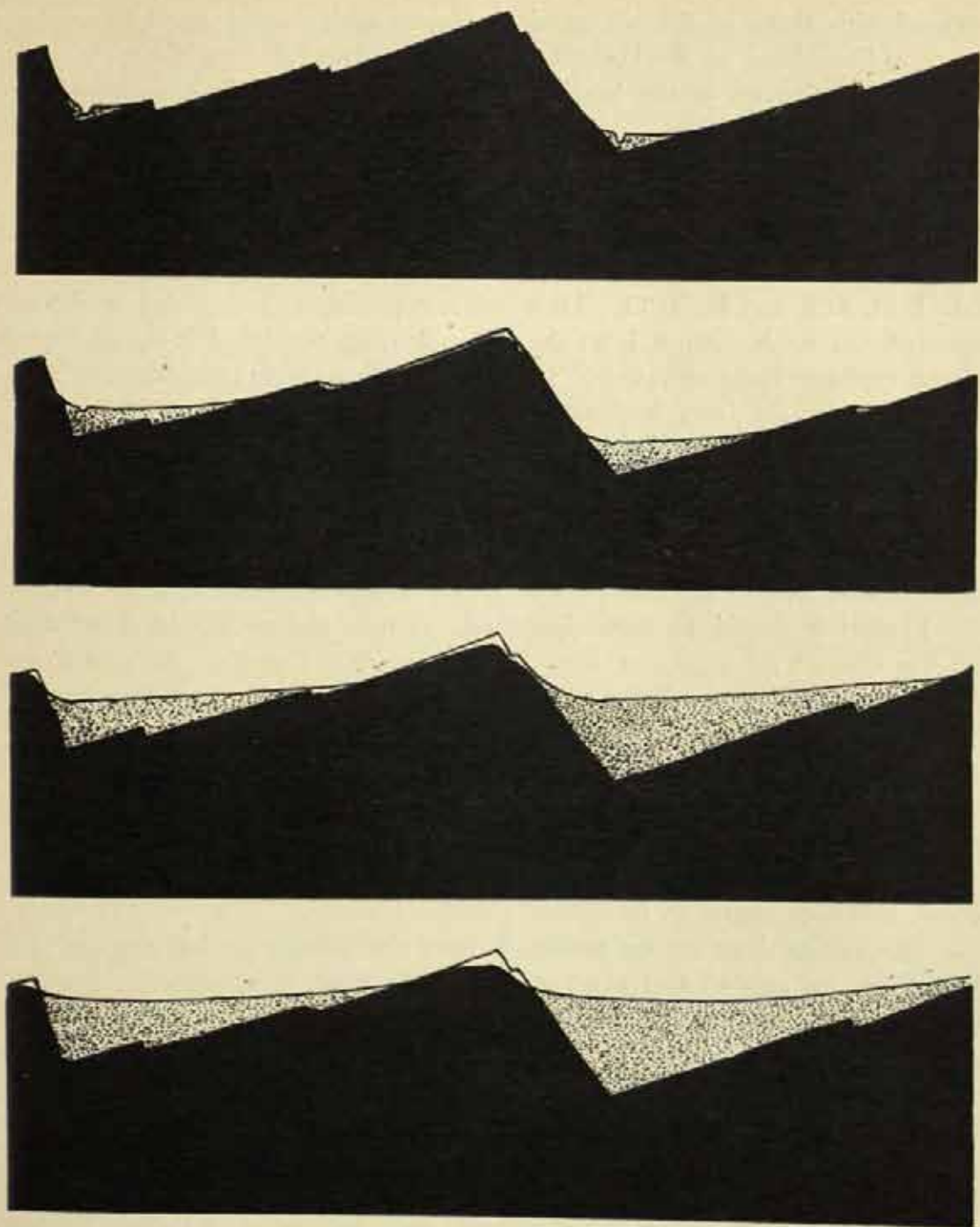


PL. XCI, A, 78-79° East Long.



PLXCI, B, 81°30' East Long.





Successive stages of the levelling activity.

A sort of Index of the gradients in Tibet is given on p. 407—420 of Vol. IV, to which the reader should pay some attention. It gives the morphology of the country in figures and shows the fall of the slopes in the peripheric regions as

compared with those of the self-contained plateau-land, from 1:24 at Dolma-la, to 1:4000 at Dung-kang on the Upper Indus. It also shows how very slowly the ground rises to the flat passes in the interior, a fact due to the levelling agencies of the atmosphere described above.

* * *

No description in words would be able to give a clearer idea of the relief and morphology of the Tibetan highlands than the series of profiles which are found on Pl. XCI, Pl. XCII and Pl. XCIII. Their number is six, and they run meridionally, from north to south. North is to the left and south to the right of each profile, and the spectator looks eastwards. The horizontal scale is 1:3500000, the vertical scale 1:350000; the latter is therefore 10 times greater than the former.

The meridians I have chosen are $78^{\circ} 30'$, $81^{\circ} 30'$, 85° , 87° , $90^{\circ} 30'$, and $92^{\circ} 30'$ East Long. It should be noticed that I have not absolutely adhered to everyone of the meridians mentioned. If, for instance, along 85° East Long. I have not been able to find a pass in a range the altitude of which is known, I have taken the nearest known pass to the east or west of 85° East Long. on the same range.

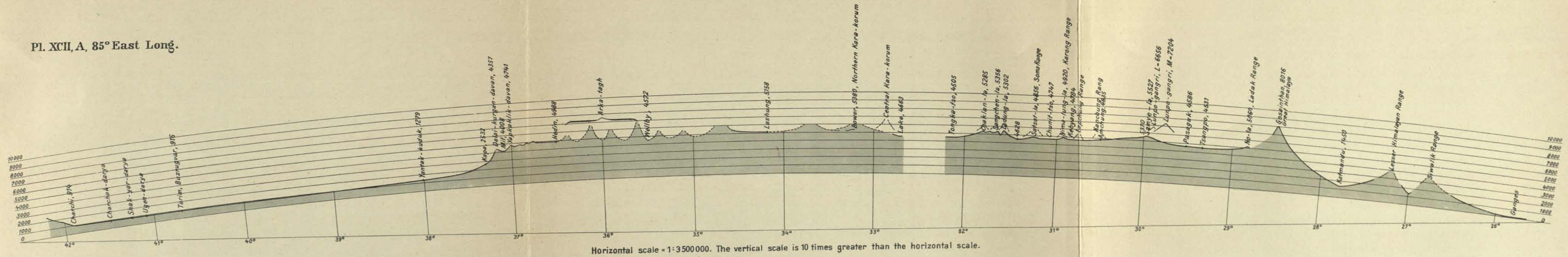
Further it should be remembered that each of the profiles is drawn as if it were the itinerary of a journey from north to south. Therefore the passes, which in reality are the lowest points of the ranges, on the profiles have the appearance of peaks, as for instance on Pl. XCI^A, the Sanju, Hindu-tash and Suget Passes. And therefore the differences in altitude between the lowest points of the depressions and the mean altitudes of the ranges is in reality greater than on the profiles, for the passes are always lower than the average altitudes of the ranges.

The O-line at the base of each profile, which is equivalent to the surface of the sea, has been drawn in its natural globular form.

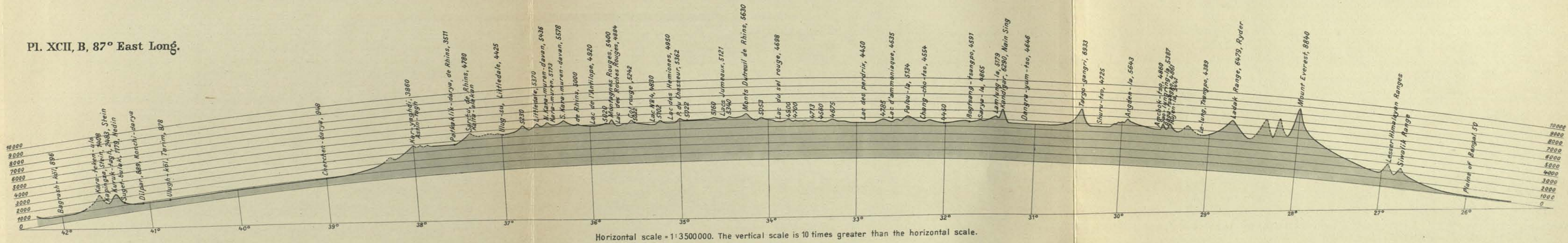
The vertical lines on the profiles indicate the latitudes in half degrees, and it will therefore be easy to find every station on the map in 1:1000000 from which I have made the original sketches of the profile lines. Thus the distances may be directly read from the O-line in everyone of the six cases. The distances, however, are only approximate, for, as I said before, in some cases I have not been able to follow the strictly meridional lines. By reason of the general form of the Tibetan highlands, the six profiles increase in length as we proceed from west to east.

It is easy to notice the great resemblance prevailing between the different profiles. To the north we have always the deep depression of Eastern Turkestan, and to the south the plains of India rising, at the base of the Himalaya, only a few hundred feet above the sea. Between both depressions is the enormous protuberance of the earth's crust which is called Tibet. Along the northern edge of this protuberance we always find the Kwen-lun Ranges, and along the southern margin the

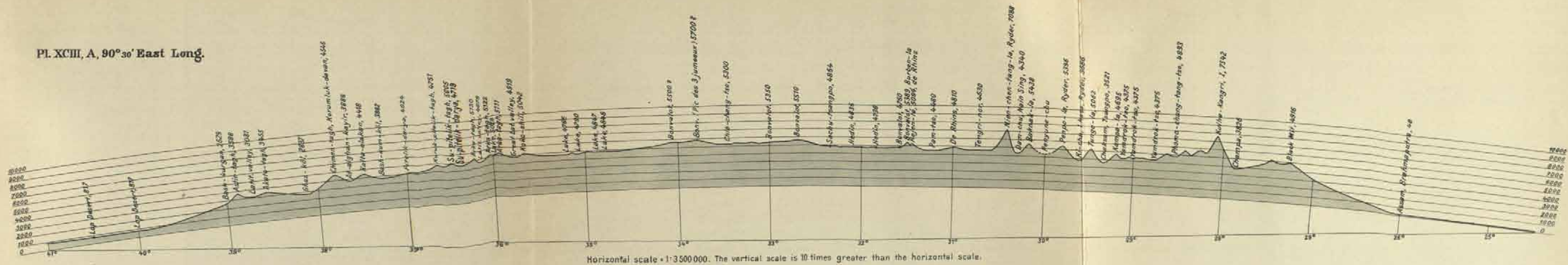
Pl. XCII, A, 85° East Long.



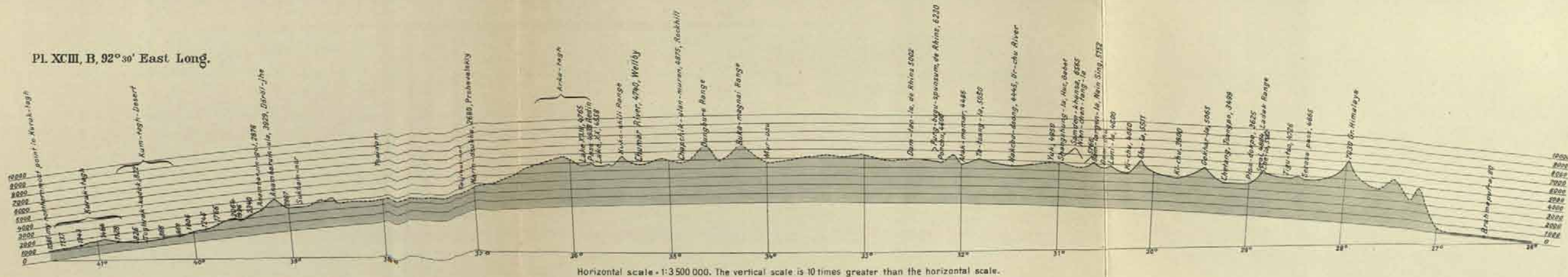
Pl. XCII, B, 87° East Long.



Pl. XCIII, A, 90° 30' East Long.



PL. XCIII, B, 92° 30' East Long.



Himalaya. Between these border ranges we meet the different ranges of the plateau-land, the highest and most complicated of which is the Transhimalaya. Between the latter and the Himalaya we find in the four last cases the valley of the Tsangpo. Regarding the Himalaya I have thought it unnecessary to enter into any details; the Lesser Himalayan Ranges have simply been taken from BURRARD'S frontispiece map.

On the first profile, Pl. XCI^A, which is situated chiefly in the strip of land between 78° and 79° East Long., the most striking features are the Kara-korum Ranges with their highest peak, K 2, 8610 m. in altitude, and with the deep valley of the Shayok being at an altitude of only 3139 m.

On the second profile, Pl. XCI^B, which follows approximately the meridian of 81° 30', we recognize a section of the whole Tarim Basin, from the southern foot of Tien-shan to Keriya, 1444 m. from where the ascent to the peak of Mustagh, 7282 m., is enormously steep. Further south follow the famous Alung-gangri, c. 7000 m., the source of the Indus, 5165 m., the Kailas, 6716 m., the Manasarovar, 4602 m., and the Gurla-mandata, 7727 m.

Pl. XCII^A shows a profile running approximately along the meridian of 85° East Long. Here again we have a section of the Tarim Basin from the southern edge of which the ground rises steeply to the Kwen-lun Ranges and Arka-tagh. At the sides of my passes of Dalai-Kurgan and Yapkaklik, 4357 and 4741 m. resp., there are, of course, high crests and peaks which are not entered on the profile, as both their altitudes and topography are unknown. In the Transhimalayan section of the profile we notice the highest Lunpo-gangri peak, M, which I measured and found to be 7204 m. high, and which is the highest known peak of the system. There follows the Tsangpo at 4531 m., and finally we have in rough outlines the Himalaya ranges.

A variation of the same morphology is found on the profile, Pl. XCII^B, along the meridian of 87° East Long. It begins with Bagrash-köl, 896 m., and embraces the Kuruk-tagh, the great desert, and the gradually rising mountains up to the Kwen-lun and the plateau-land south of it. There is Bogtsang-tsangpo, 4591 m., and Dangra-yum-tso, 4646 m., and there is the highest peak I measured on the Targo-gangri, 6933 m. Then follows the rest of the Transhimalaya down to Lelung on the Tsangpo, 4389 m., and finally the Himalaya with Mt. Everest, 8840 m. high.

Pl. XCIII^A along the meridian of 90° 30' East Long. shows a comparatively gradual rise from the desert to the northern border ranges of Tibet, and a comparatively flat part of the plateau-land. From the Tengri-nor, 4630 m., the Nien-chen-tang-la rises to its highest known peak, 7088 m. high, measured by RYDER. South of it are other Transhimalayan ranges, situated north of the Tsangpo, 3521 m. high at Chaksam. South of Yamdrok-tso, 4375 m., follow the Himalayan ranges.

The last profile in the series, Pl. XCIII^B, shows a section of the intermediate plateau-basin of Tsaidam between the desert and the high plateau-land south of the

Arka-tagh. In the southern part of the profile we again see the Tsangpo, 3499 m. high at Chetang, as a depression between the Transhimalaya and the Himalaya.

I have sketched an additional series of profiles of my eight routes across the Transhimalaya. I begin in the west and proceed eastwards, and each profile starts from the north. The first, Pl. XCIV^A, shows my route between Gyäkung and Gartok, crossing the Yukti-hloma-la, 5821 m. high. The second, Pl. XCIV^B, is the route between Gyäkung and Rakas-tal, crossing the Tseti-la, 5628 m. high. The third, Pl. XCV^A, represents the route between Nganglaring-tso and Manasarovar, crossing the Chargo-ding-la, 5885 m. high. The fourth profile, Pl. XCV^B, takes us along the road between Chunit-tso and Charte, crossing Samye-la, 5527 m. high. Pl. XCVI^A goes between Teri-nam-tso and the Tsangpo, the water-parting pass on the road being the Sangmo-bertik-la, 5820 m. high, and Pl. XCVI^B runs between Dangra-yum-tso and Tsarok crossing Angden-la, 5634 m. high. Finally Pl. XCVII^A goes between Targo-tsangpo and Lingö, passing the Chang-la-Pod-la, 5572 m. high, and Pl. XCVII^B runs between Ngangtse-tso and the Tsangpo, its water-parting pass being the Sela-la, 5506 m. high. Pl. XCVIII gives an idea of the altitudes along my road from Teri-nam-tso to Nganglaring-tso.

* * *

A third series of profiles illustrates my journeys in Eastern Pamir which are described in Vol. IX of the present work, and to which Colonel BYSTRÖM has drawn from my original survey the map in 1:500000 accompanying this work. As the Pamir is in intimate connection with the Tibetan highlands I think it suitable to insert these profiles in connection with those from Tibet. The first and the last in the series are not to be found on my Pamir map, and the road illustrated by the last has not been surveyed by me.

The first profile, Pl. XCIX^A, shows my road in 1899 from Osh across the passes of Chigirchik, Taldik and Tong-burun to Kashgar. In the following table I have entered the stations, their altitudes according to my own observations and according to the map of the Russian General Staff¹, and the distances in kilometers. In a few cases the altitudes show considerable discrepancies. In Osh I found an altitude of 1023 m., whereas the Russian map has 1322 m.; Andrée's Handatlas, 1905, has 1010 and Stieler's, 1909, 1230. The observations are obviously taken at different places. On the Taldik Pass and at Min-yol the differences also amount to about 200 m. For Kashgar I found 1304 m., the Russian map gives 1325, Grombtchevskiy 1385, Pievtsoff 1312 and Deasy 1443 m.

¹ At my disposal is only one sheet of the great Russian map of Russian Turkestan in 1:420000. The title and the year are missing.

Pl. XCIV. A.



Pl. XCV. B.



Pl. XCV. A.



Pl. XCV. B.



Pl. XCVI. A.



Pl. XCVI. B.



Pl. XCVII. A.



Pl. XCVII. B.



Pl. XCVIII.

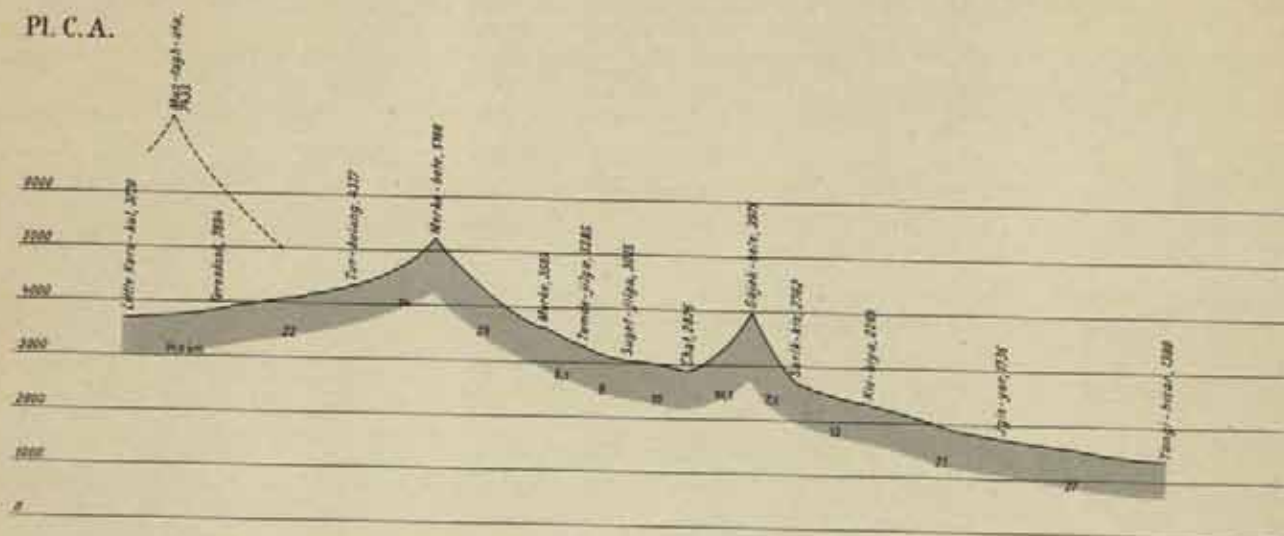


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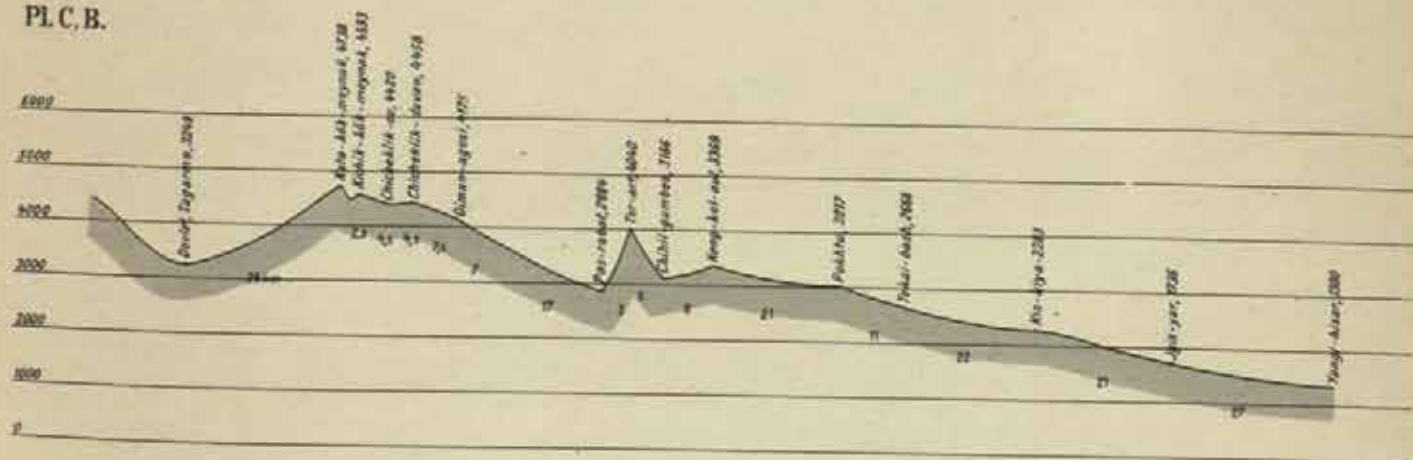
Figure 1 is a line graph showing the average annual precipitation (mm) for the period 1961-2000. The y-axis represents precipitation in millimeters, ranging from 0 to 7000. The x-axis represents the year, from 1961 to 2000. The graph shows a significant peak in precipitation around 1975, reaching approximately 5000 mm. The area under the curve is shaded, and the curve is labeled "Average annual precipitation, 1961-2000".

[illegible][illegible]

PL C.A.



PL C.B.



Station	My observations	According to Russian map	Distances
Osh	1023 m.	1322 m.	
Madi	1140		14 km.
Chigirchik Pass	2371	2385	46
Gulcha	1529	1591	15
Kisil-kurgan	1734	1844	18
Kulânke-tokai	2032		16
Beyond Kisil-beles	2642		33
Bosoga	2863		7
Taldik Pass	3587	3806	8
Sarik-tash	3235	3320	18
Äilämä	3364		26
Tong-burun [†]	3562	3674	4
Irkeshtam	2860	2802	24
Nagara-chaldi	2628		17
Semis-khatum (Kisil-su)	2508		22
Kosh-bichak Pass	2815	2841	22
Mashrab Pass	2543		17
Kan-jugan	2179	2133	51
Min-yol	1779	1575	32
Kashgar	1304	1325	39

Pl. XCIX^B is a profile of my road in 1895 from Kashgar to Muchi in Eastern Pamir, crossing the pass of Ulug-art, 5150 m. high. Pl. C^A, shows my road from Little Kara-kul to Yangi-hisar, 1894, leaving to the south the Mus-taghat, 7435 m. high. Two border ranges are visible here, indicated by Merke-bele, 5198 m. high, and Gäjek-bele, 3975 m. high. On the next profile, C^B, between Tagarma and Yangi-hisar, two ranges are again clearly visible, in the westernmost of which we find the passes of Kata-kök-moynak, 4738 m., Kichik-kök-moynak, 4593 m. and Chichelik, 4458 m. high, and in the easternmost, Ter-art, 4040 m. The former seems to correspond to the range of Merke-bele, and the latter to that of Gäjek-bele. The mass of Mus-taghat belongs to the Kashgar Range proper. Thus there are three clearly distinguishable border ranges of Eastern Pamir, situated east of the Taghdumbash valley.

On Pl. CI^A I have entered, west of the last-mentioned valley, the Sarikol Range, indicated by Lakshak-bel, 4645 m. high. East of the Taghdumbash valley we again find three ranges crossed by my route of 1895 from Tash-kurgan to Kok-rabat, and in the profile indicated by the three passes, Särghak, 4032 m., which belongs to the Kashgar Range proper, Kandakar, 5062 m., and Arpa-talak, 3834 m. high.

[†] On the Russian map Taun-murun.

In connection with the five profiles described above it would have been very interesting to add a sixth one farther south just in the region where the Tibetan and Pamir ranges meet. This region is one of the most rugged, wild and difficult in the interior of Asia. Only a few travellers have been there. The last visitor was Captain L. V. S. BLACKER who travelled, October 1918, from the uppermost Taghdumbash Pamir to Kōk-yar, crossing an endless series of difficult passes. It was a plucky and courageous undertaking, and the warlike conditions under which it was carried out, are sufficient excuse for the meagerness of his description and his map—from a geographical point of view.¹

Still, Blacker's little sketch-map may give us some idea of the extremely accentuated character of this part of the mountains between Pamir and Tibet, especially if we add to it some dates from previous travellers. When Blacker says of the valley of Chup that it is »blank on the map», he has forgotten that GROMBTCHEVSKIY has travelled along a part of it², and when he says that »a hamlet called Bulun», is »not on the map», he overlooks the fact that this village is entered on BOGDANOVITCH's map *Марирутная съёмка отъ урочища Ташта-хонъ до рѣки Яркендъ-дарьи и обратно*, published in PIEVTSOFF's work quoted above.³ So even if the country is not »untrodden», BLACKER is quite right in saying it is nearly »unknown», for, as a rule, the results brought back from this region by his predecessors are very poor, especially so far as the maps are concerned.

GROMBTCHEVSKIY's map of these parts of the world is called *Карта путешествій подполковника Громбчевскаго въ Дарвазъ, на Памиръ, въ Джиты-жааръ, въ Канджунъ, въ Раскемъ и въ сѣв. зап. Тибетъ, въ 1885, 1888, 1889 и 1890 годахъ*; 1:840000, published 1895. It is not a reliable map, and especially his altitudes are impossible, being sometimes 500 or 600 meters too high. But on the other hand I cannot tell how far Blacker's altitudes are, approximately, more reliable. In some cases his passes are much higher than the heights given by Grombtchevskiy. The pass of Sakrigu is 3575 m., according to Grombtchevskiy, and 4878⁴ according to Blacker, and the Ak-korum is 3390 m. on Grombtchevskiy's map, and 4268 on that of Blacker.

The pass of Kara-tash of Blacker is also to be found on the Russian traveller's map, though he crossed another pass, called Chup, situated a few versts south of it in the same ridge. The two passes whose names Blacker could not find out as he

¹ Geographical Journal, Vol. LVIII, 1921, p. 178 et seq. Younghusband said before the paper: »He (Blacker) had the disadvantage of having to travel so rapidly that he had little opportunity for making and recording observations of geographical interest».

² I only heard the name in 1895; cf. Vol. IX, p. 74.

³ There are neither latitudes and longitudes, nor altitudes on this map; only an arrow indicating the north.

⁴ His altitudes are only approximate and in feet. I have changed his figures into meters.

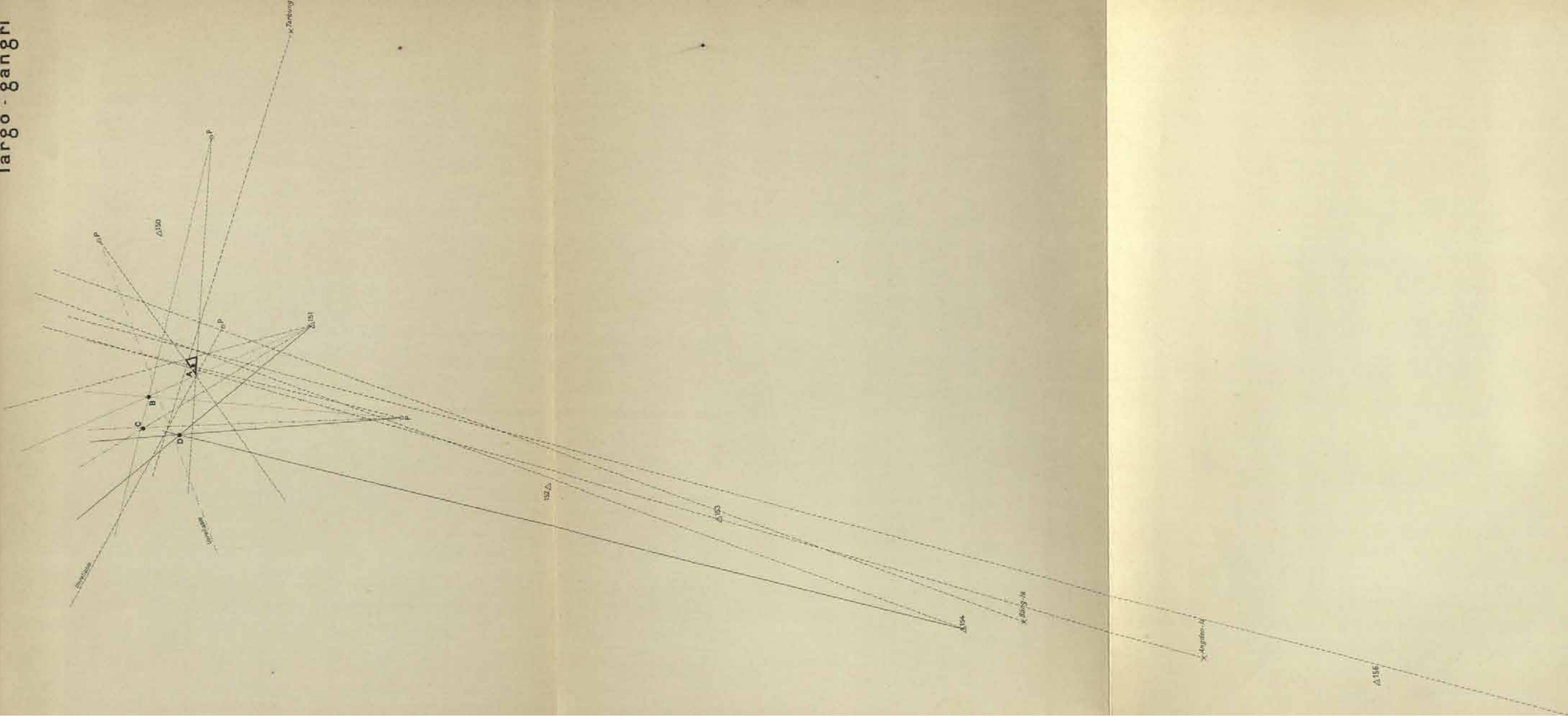
met no human being there, are obviously the Kok-art and Yangat¹ of Grombtchevskiy, who has still a Kutluk and a Sauk Pass on the same track.

The first half of the itinerary of Blacker has also been covered by DEASY and is to be found on his *Map of Portions of Western China and Tibet explored by Capt. H. H. P. Deasy, in 1897—98—99*, Sheet No. 1 and Sheet No. 3. This is the best map existing of this section, though it is not always easy to tell to which names the figures of altitudes belong.

In spite of these difficulties I have put together in the table p. 595 the altitudes and distances of the different travellers along the road in question. From the dates in this table I have drawn the profile Pl. CI^B, making use of those figures which have seemed to be most reliable. In cases where only one observation exists I have taken it as it is.

The profile I have been able to put together from the data in this table is only approximately correct. From the result obtained, it is impossible to draw any reliable conclusions as to the relations between the ranges of Pl. CI^B and those of Pl. CI^A, for, as the different passes are taken from different travellers, it may easily happen that two or even three passes in reality belong to one and the same range. In this portion of the magnificent protuberance of mountains, innumerable geographical and geological problems remain to be solved by future explorers.

¹ Probably Yangi-art, «the New Pass».



CHAPTER LXIV.

TRIGONOMETRICAL MEASUREMENTS OF SOME HIGH PEAKS IN THE TRANSHIMALAYA.

During my last journey in Tibet I measured the altitude of 20 peaks, all, with the exception of three that belong to the Kubi-gangri, situated in the Trans-himalayan system. The measurements were carried out with the same theodolite which I used for the astronomical observations.

Professor Karl D. P. ROSEN has been kind enough to examine my observations, and to calculate the altitudes from the collected data.

The distances from the different stations to the objects were determined by Colonel H. BYSTRÖM from his map in 1:200000. My bearings to the peaks were entered on this map, and the situation of the different objects was found by the intersection of the bearings. Pl. CII shows the procedure followed in the case of the peaks A, B, C, and D of Targo-gangri. The scale is 1:200000, and the diagram can therefore be directly compared with the map. Δ 150, 151 etc. are camps; \odot P are points from which panoramas with compass bearings were sketched. Determining the situation of peak A Colonel Byström has chiefly made use of the nearest stations. In the triangle of error marked with thick lines which was obtained by the intersections of these bearings, the point of intersection of the diagonals was fixed, and this point was also found to be cut by the bearing taken from a station halfway between Camps 151 and 152 which was situated at a short distance from the object. The 72 km. long bearing from Angden-la also cuts the same point of intersection, which must be regarded as rather accidental, as the other long bearings fall more or less outside of the triangle. The determination of the location of the other three peaks, B, C, and D, does not demand any further explanation, as the procedure is clearly visible from the diagram.

Pl. CIII shows the same procedure in the case of the five peaks, M, L, K, J and J₁ of Lunpo-gangri and of the »White Cupola» north of it. Determining the location of the last-mentioned peak, Colonel Byström has altogether rejected the two easternmost long bearings. It is true that the four bearings from the south meet

one another in a point situated much farther north. But, on the other hand, the bearing taken from a near point between Camps 377 and 378 cuts the long bearings at nearly right angles and seems to decide the position of the »White Cupola» in the meridional direction. However, it is not impossible that I have confused the »White Cupola» with another peak of the same form situated farther north. Both the situation and the altitude of the »White Cupola» must therefore be regarded as uncertain.

The determination of the situation of the other peaks, J₁, J, K and L does not demand an explanation. The situation of peak M in a meridional direction is determined by the bearings from the threshold 5430 m., Camp 381, Samye-la and Camp 382. Its situation in a latitudinal direction is chiefly determined by the bearing from Camp 383. No importance has been given to the long bearings, which always are more unreliable than the short ones. However, peak M is situated exactly between the two longest bearings.

The same procedure has been followed in the cases of the other peaks, though I have thought it sufficient to reproduce only these two diagrams of Colonel Byström.

The distances thus having been calculated by Colonel Byström, Professor Rosén calculated the altitudes, and made the following table (p. 599), where all the necessary data are entered.

To this Professor Rosén adds the following note:

»The exactitude of these determinations must be judged chiefly in connection with the following three points:

»1. From a great number of terrestrial zenith-distances a mean error of $\pm 20''$ for one zenith-distance has been obtained. This pure error of measurement is, in comparison with other sources of error, infinitely small, as are certainly also the variations in refraction.

»2. The distances have been calculated from the map and compass bearings. Here it should be noticed that identical objects have been observed from different points of observation. By means of existing photographs, panoramas and annotations in the diaries of observation, a critical examination has been carried out so that no mistakes or errors are possible in this respect. The intersections of the bearings are as a rule satisfactory. The distances may therefore be regarded as being of the same exactitude as the itinerary which, of course, is the base from which the bearings that determine the distances have been taken.

»3. It is finally obvious that the altitudes of the stations, *i. e.* the foundation of the determinations of the altitudes, enter with the whole of their uncertainty into the trigonometrical results.

»If these sources of error are compared as to their influence on the result, it is found that the error of distance mentioned under § 2 is of importance chiefly

by reason of the great differences in altitudes, but that the uncertainty mentioned in § 3 must be regarded as still greater. The reliability of the trigonometrical measurements may therefore, in the case of *one* observed zenith-distance, be regarded as not much less than an altitude determined by means of the atmospheric pressure. A trigonometric altitude determined from two or more zenith-distances may, on the other hand, be regarded as having at least the same value as the altitudes of a station.»

It is not quite impossible that my Lunpo-gangri peaks L and M may be identical with two of Ryder's and Wood's three measured peaks in the same neighbourhood, though I have the impression that the range is double, and that L and M were not visible from the stations of the British officers.

On Ryder's map there are three peaks situated on a range stretching N. W.—S. E. From N. W. to S. E. they have the following altitudes: 21 600 feet or 6585 m., 23 150 feet or 7058 m., and 21 300 feet or 6494 m. My peaks K, L, and M are also situated on a crest running N. W.—S. E., though not on a straight line, as Ryder's. Peak K is 8,2 miles N. N. E. of Ryder's 21 600 feet; Peak L is 10 miles N. N. E. of Ryder's 23 150 feet; and Peak M is 5,6 miles N. N. E. of Ryder's 21 300 feet. But the altitudes of my three peaks increase from N. W. to S. E. as follows; 6475, 6656 and 7204 m., whereas Ryder's highest peak is the one in the middle; 6585, 7058 and 6494 m.

The principal reason why I believe that we have to deal with two different ranges parallel to one another is that Ryder's three peaks are situated exactly on the prolongation of the range where I have my peaks J and J₁, and this range runs at a distance of some 7 miles S. W. of the range of K, L, and M.

Further, on the panorama from Camp 383 (Vol. III, p. 318), there are visible two snow-covered peaks to the S. 60° W. and S. 62° W. behind the Peak M, and exactly in the direction where Ryder has his peaks of 7058 and 6494 m.

At any rate my Peak M, being 7204 m. high, is the highest so far known on the Transhimalaya, and in the rest of Tibet it is only exceeded by a few peaks on the border ranges, such as Gurla-mandata, 7727 m., the Ulug-mustagh, 7360 m., and the Mustagh, 7282 m. high.

ADDENDUM.

DE FILIPPI'S EXPEDITION ACROSS THE KARA-KORUM MOUNTAINS.

In the years 1913 and 1914 Dr. FILIPPO DE FILIPPI carried out a very important expedition from Leh to Yarkand across the difficult mountain region between the Himalaya and Kwen-lun, including the Kara-korum and Aghil Systems.¹ Since Forsyth's Second Mission to Yarkand no expedition has entered this part of Asia so completely organized and so well equipped as that of Dr. DE FILIPPI. From purely scientific point of view it stands without rivals. In Forsyth's days nearly all the ground covered meant important geographical discoveries. For the Italian expedition the detailed physical, mathematical, geological and biological investigation remained to be done, and the gratitude of the geographical world is indeed due to this expedition for the excellent way in which its gigantic program was carried through. Dr. DE FILIPPI had no less than nine European officers and experts on different branches of science under his command, *viz.*, Mssr. ALESSIO, ABETTI, ALESSANDRI, VENTURI-GINORI, SPRANGER, MARINELLI, DAINELLI, ANTILLI, and Major WOOD, well known from Ryder's expedition in the Tsangpo valley 1904.² He was also accompanied by a guide, J. PETIGAX, and by native assistants of the Survey of India.

One of the most important items of the program »was the establishment of a series of geographical stations for observations of gravity and magnetism, to stretch in an unbroken chain across the vast and mountainous zone which separates India from Central Asia, and to be carried on through Chinese Turkestan as far as Russian Turkestan, thus uniting in one comprehensive system two pre-existing sets of gravimetric stations, namely, that of the Indian pre-Himalayan plains carried out by the Trigonometrical Survey of Dehra Dun, and that of Russian Turkestan and the adjoining regions». Further the longitudes were determined by means of wireless

¹ By a deplorable mistake my short extract of DE FILIPPI's journey was not inserted at its right place, *viz.*, after the last expedition of the Workmans. That is the cause why it follows now as an Addendum.—Cp. Geographical Journal, Vol. XLVI, p. 85 et seq.

² Cp. above Vol. II, p. 243, Vol. III, p. 216, and Vol. VII, p. 600.

time-signals according to a preconcerted plan. In 17 months the whole program was carried through, and all that has been done by other travellers and expeditions in this region, and all that will be done there in the future will have to be corrected from and built upon the solid ground conquered by the Italian expedition.

Just as Forsyth's mission de Filippi's Expedition was subdivided into a series of separate undertakings and excursions, *e. g.* to the valleys of the Sind, Dras and Indus, the basin of Skardu, the valleys of Shigar, Braldoh and Basha, the valleys of the Shayok, Saltoro and Kondus and parts of the largest glaciers of the Kara-korum, the Biafo, the Baltoro and the Chogo-lungma.

At Leh the expedition had its headquarters for two and a half months, and then crossed the Chang-la and entered the Shayok-valley which was thoroughly investigated.¹ The Murgo-valley was passed, and the geologists visited the snouts of the Chong-Kumdan, Kichik-Kumdan, and Aktash Glaciers, but it does not appear from the report in the Geographical Journal whether the ordinary caravan road was closed by the glaciers or not. For in 1909, 1910 and 1911 the road was closed according to news I got from Gulam Rasul of Leh.² Two marches above Murgo they arrived at a spot called Kisil Langur³, and nearly at the centre of the partly snow-covered Dapsang plains they made their choice of a new headquarter and base of supplies which had to serve nearly the whole summer of 1914. In the following words DE FILIPPI gives a very good description of this dreary region: »All around us, for a radius of 12 to 15 miles, stretched a vast and hillock-strewn plateau with shallow depressions inclining to the north-east, and merging to the east into alluvial plains which form part of the vague watershed between India and Turkestan. The edges of the plateau are uncertain and ill-defined, and shade off gradually into gentle slopes, except towards the south-west, where towers a majestic glacier-covered mountain which completely dominates the region. In the far distance, and on every side, rise a circle of lofty mountains, whose peaks just appear above the edge of the plateau, those to the south and west are dazzlingly white from their covering of snow and glaciers, and are in startling contrast to those in the direction of Asia (?) and Central Tibet, which have the forbidding appearance of bare rocks. The surface of the plateau is a mass of minute detritus, and is entirely devoid of vegetation, except for occasional patches of a yellowish-green plant which at first view suggests, more than anything else, some malignant disease of the soil. There

¹ The altitude of Leh was determined to 3506 m., exactly the same as I had got from observations during 3 1/2 months in 1901—1902. Cp. Scientific Results, Vol. V, Part Ia, p. 308—316. On the other hand there is a considerable discrepancy for the Chang-la, where the Italians have 5600 m., whereas I found 5360 in 1902 and 5355 in 1906.

² Cp. Vol. II, p. 197.

³ Probably identical with my Kisil-ungur, »The Red Gorge», where I found the altitude of 5128 m., the Italians 5000 m. The base camp was at 5305 m. In the same region I had 5227 m.

can surely be few corners of the world which give such an impression of dreariness and utter desolation as this barren region of rocks and stones, which, moreover, during our entire sojourn was swept continuously by an icy wind and beaten upon by hail and sleet.»

On June 11 the geologists made an excursion in the direction of the Tibetan plateaux, crossing a pass 6100 m. high and joining the basin of Taldat to the north of Ling-si-tang. DE FILIPPI with other members of the expedition set out, on July 1, to explore the Indo-Asiatic watershed to the east of the Siachen Glacier. The Remo Glacier was found to be divided into two main branches which descend from their respective valleys to the north and west, and join almost at right angles. Some 10 miles above the front they came to a large basin which receives from the north a tributary glacier nearly as large as the chief branches of the Remo. This tributary glacier proved to be of very great interest. A little above its junction with the main glacier, there flowed through a cleft in the mountain to the east a short and thick tongue, giving birth to a river which evidently did not belong to the basin of the Remo. Three days before, WOOD and his party had penetrated through a saddle to the west of the Kara-korum Pass into a large circus of confluent valleys which they identified as belonging to the basin of the Yarkand, and following up the river they had arrived at this particular point of the tributary glacier of the Remo Glacier. The surveys of both parties were thus connected in the most excellent way. Of this remarkable discovery DE FILIPPI says: »We had thus not only discovered the source of the Yarkand, hitherto erroneously marked on nearly every map as rising near the Karakoram Pass, but we had also ascertained this remarkable fact—that it flows from the same glacier which gives rise to the River Shyok.» J. W. HAYWARD had therefore made a mistake when he believed that he had discovered the source of the Yarkand-darya. He said: »On the afternoon of the 8th December I reached the source of the Yarkand River».¹ And I was mistaken when I wrote: »it seems very likely that HAYWARD discovered the source of the Yarkand-darya».² For the small lake which HAYWARD in 1868 identified with the source of this river, DE FILIPPI found to be 20 miles further up the valley, »and to have practically no importance as regards the feeding of the river». YOUNGHUSBAND was indeed right in saying: »The most interesting purely geographical statement which Dr. DE FILIPPI made . . . was his account of the discovery of the source of the Yarkand River, and the remarkably interesting point that the same glacier which gives rise to the Yarkand River also gives birth to the Shyok River . . . so that while some of the water of this glacier goes off into Central Asia and buries itself eventually in the great desert of Gobi, the rest goes off south into the Indus and the Indian Ocean . . . That is

¹ Cp. above p. 269.

² Cp. above p. 271.

a point of great geographical importance, upon the discovery of which this Society should most sincerely congratulate Dr. DE FILIPPI.»¹

After having climbed to the watershed saddle of the tributary glacier, being 5884 m. high, DE FILIPPI returned and completed the exploration of the main branch of the Remo Glacier. One of its saddles leads to the Siachen Glacier, another, to the north, marks the watershed. With great energy and admirable pluck the region was explored in many directions in spite of very severe weather and heavy snowfalls which hindered the expedition in its work. DE FILIPPI tells us that even the ordinary caravan road across the Kara-korum Pass which nearly always is open, now for some days had been encumbered with snow. »It may therefore be assumed that the summer of 1914 was an exceptionally unlucky season.» It would be of great interest to know whether this heavy precipitation during the winter of 1913—1914 has had any consequences as regards the hydrography of the Manasarovar—Rakas-tal—Satlej system. From the reports of the reconnaissance expedition to Mount Everest in 1921 one also gets the impression that in the Eastern Himalaya as well, though several years later, the precipitation has been heavier than usual.

August 20 the Kara-korum Pass was crossed. Its height was found to be 5800 m.² Again the expedition was split into two parties. DE FILIPPI took the way of the Suget-davan, 5400 m.³, to Suget-karaul in the Kara-kash valley, after which Kirghiz-jangal in the Yarkand-darya valley was reached. It is a pity that his plan of exploring the Oprang valley, which previously had been visited only by YOUNGHUSBAND⁴ and GROMBTSHEVSKIY⁵, had to be abandoned. It is also a pity that his intention to explore the Aghil Range⁶ could not be carried out by reason of the late season. Again YOUNGHUSBAND is right when he says: »The source of the Oprang River and its upper basin still remain to be explored, and it is one of the most interesting fields of exploration still remaining in the Himalayas».⁷ Still the Western tributaries of the Yarkand-darya, contrary to the surmises of DE FILIPPI, were not found to rise on the northern slopes of the Kara-korum, but from a snow-bound chain to the north of it, which was supposed to separate the basin of the

¹ At another place DE FILIPPI says of this glacier: »The Remo is a glacier of unexpected size and importance. Its area is more than 300 square miles in extent and is formed by three large rivers of ice, each about 20 miles in length and 3 to 5 miles wide. The glacier has many peculiar characteristics, and its basin is, as it were, a transition between valley and plateau. This is only an instance of a more or less general phenomenon which we found prevalent in our explorations of the region.» *Geographical Journal*, Vol. XLV, p. 232.

² I have 5658 m.

³ I have 5434 m.

⁴ Cp. above p. 355.

⁵ Cp. above p. 356.

⁶ Regarding the Aghil Range in its relation to the Kara-korum and Kwen-lun, according to BURRARD, cp. above p. 489.

⁷ *Geographical Journal*, Vol. XLVI, p. 102.

Upper Yarkand-darya from that of the Oprang. »When the map is drawn we perhaps shall be able to judge what relation this chain has with the Aghil and the Karakoram.»¹

Seven years after the paper of DE FILIPPI was read to the Royal Geographical Society, Lieut.-Colonel H. WOOD published an important article on his survey in the Upper Yarkand valley, being a part of the Italian expedition.² WOOD points out that previous to 1914 our knowledge of this region was based on the sketches and reports of JOHNSON of the Survey of India in 1864—1865, and of HAYWARD in 1868, but that SHAW had, in 1876, expressed doubts as to the accuracy of this mapping. He returns to the interesting fact that the Shayok and Yarkand rivers »have a joint origin in one glacier». In the following words he explains the mistake committed by HAYWARD regarding the presumed source of the Yarkand-darya: »He reached this place in December, when the whole country was deep in snow, and his description therefore is somewhat misleading in places. No glaciers extend into the basin, nor are there any on the adjoining slopes. His visit was very hasty, and it is certain that he could not have seen the large western valley at the south end of the amphitheatre, for he was a careful and accurate recorder of everything that he saw. Nor is the basin a lake, as he surmised, though a small tarn, entirely disconnected from the river system, actually exists in it.»

The source of the Oprang (or Uprang) valley, which was not explored, is supposed to be situated some 30 or 40 miles further east than YOUNGHUSBAND had suspected in 1889.

From south of the Dapsang plateau to Kirghiz-jangal in the north the only formations are limestone and sandstone, which, at least for the southern portion of this belt of land, agrees with my results farther east.

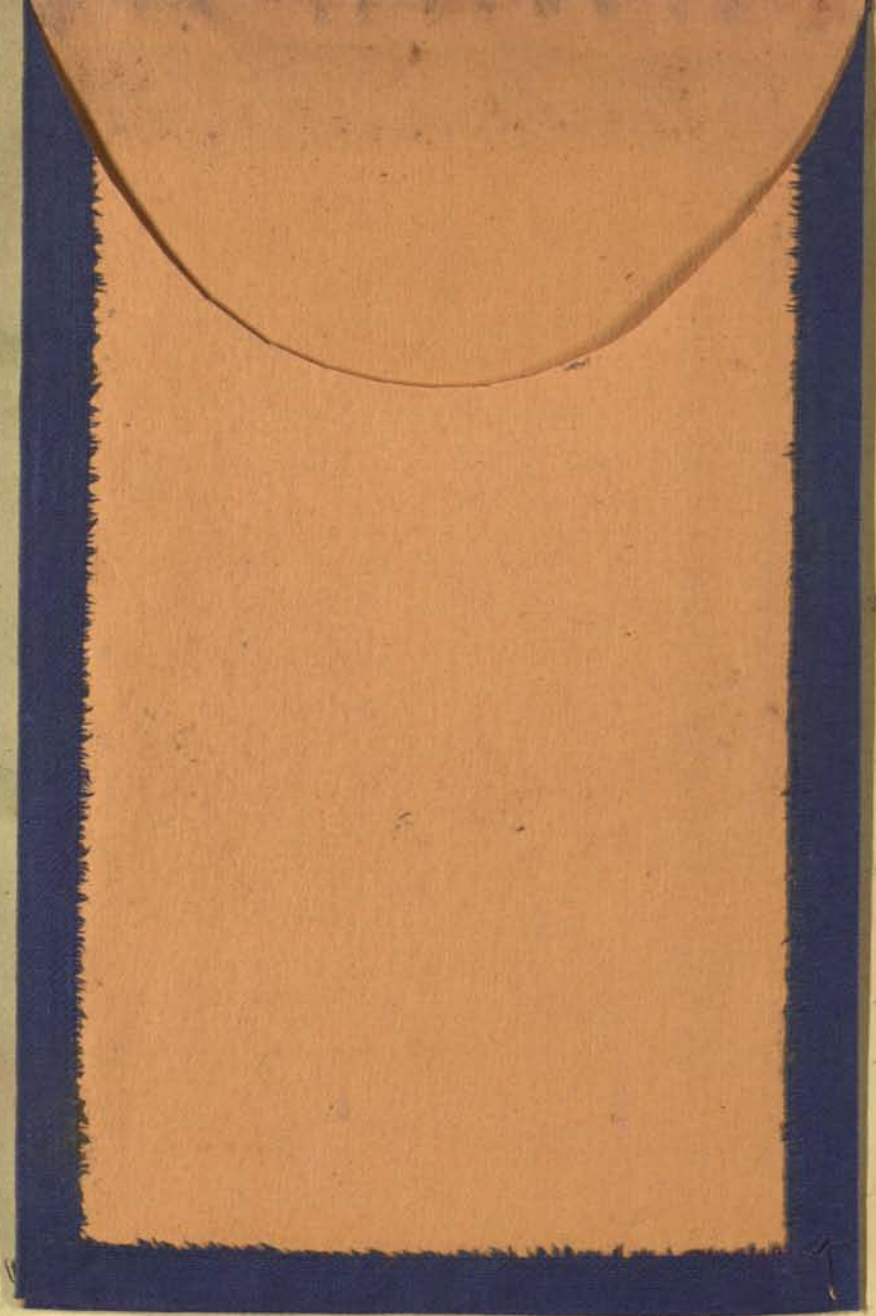
The little sketchmap accompanying WOOD'S article gives a very clear idea of the important geographical discoveries made by the Italian expedition so far as the source branch of the Yarkand-darya is concerned. Unfortunately we could not make use of it when the map in 1:1,000,000, accompanying the present work, was drawn by Colonel BYSTRÖM. A comparison between Sheet VII of our map and WOOD'S sketchmap clearly shows how necessary the exploration of this nearly unknown region was.

When the detailed account of the work of the Italian expedition in due course will be published we will no doubt be able to improve our general orographical maps of this extremely complicated and difficult region. Of particular interest it will be to learn in how far the importance of the Aghil Range in its relation to the Kara-korum System will be cleared up.

By his strictly scientific methods DE FILIPPI has inaugurated a new era in the history of exploration in these parts of High Asia, and he may indeed be said to have maintained the place of honour held by Italy in the great continent ever since the days of MARCO POLO.

¹ Geographical Journal, Vol. XLV, p. 229.

² Geographical Journal, Vol. LIX, p. 375.



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